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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 27 JULY, 1944 NUMBER 7

PTOSIS—POSTTRAUMATIC AND HYSTERICAL*

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Philadelphia 3

The diagnosis of hysteria as the underlying etiologic factor in a frank posttraumatic ophthalmic condition is somewhat serious. There is no doubt that legal decisions and compensation for the injury might be a most significant factor, fairly or unfairly granted. This cause (trauma) would also be relevant in cases of malingering, whether deliberate or psychopathic.

The faulty diagnosis of hysteria is as serious an error as would be the opposite; that is, to consider a true hysterical situation organic. The latter error would be unusual, the former error is the more likely; either could result in maltreatment, and be the cause of failure in recovery.

The gross inconsistencies which present themselves in cases of hysterical diplegia of the lower extremities, for instance, are rather easily uncovered, compared to the minute detailed inconsistencies possible in an oculomotor syndrome, also hysterical. It would seem that the diagnosis in the latter of the two conditions mentioned is made by exclusion rather than by conclusion, as would be the more important in the former condition.

Hysterical paralyses may be either flaccid in type, even to the wasting of the involved muscles (although such instances can be distinguished from true organic degeneration by the absence of the electrical reaction degeneration), or they may be accompanied by pseudocontractures. In either case it seems to be the result of an active inhibition, a demonstration of the patient's conviction that it is impossible for him to perform certain movements. It would seem that by the autosuggestion, which is the basis of hysteria, the patient dissociates the affected muscles (conjoined function of associated muscles) from his consciousness.

In hysterical ptosis the patient actually, as well as psychologically, is withdrawing from the world of reality, for if the lids are manually elevated he may substitute hysterical amblyopia (retinal anesthesia) for the ptosis.

Hysterical ptosis is not an uncommon finding. Roemer has described both types —a flaccid paralysis and the pseudoptosis of orbicularis contracture. Wilbrand-Saenger believes that hysterical ptosis is usually an orbicularis contracture. Purves-Stewart also has described both types—the flaccid and the contracture forms. Other references in the literature are similar as to their conclusions.

Hysterical squint or strabismus is probably caused in the same manner. In this condition, however, the consensus of opinion seems to be that it is due to a pseudocontracture. For instance, a convergent squint would be a spasm of the adductors rather than a paralysis of the abductors; conversely, a divergent hysterical squint would be the result of spasm

*From the Graduate Hospital, the Graduate School of Medicine, the University of Pennsylvania. Presented before the Section of Ophthalmology, the Philadelphia College of Physicians, April 15, 1943.

of the abductors rather than a paralysis of the adductors.

It is a neuropsychiatric truism that hysterical palsy is never an involvement of a single muscle. Hysteria, hence, manifested as a paralysis, will affect any part of the body, but unlike an organic lesion never confines itself to a single isolated muscle or to a group of muscles innervated by a single nerve or spinal segment. It has as its primary purpose the suppression of a sense, the abolition of a function, the negation of a positive act or chain of habits. This is beautifully seen in the complexities of the ocular rotations and their relationship to hysteria.

Adduction as a binocular function is a simultaneous innervation of six muscles that have bilateral, homolateral, and contralateral nuclear origins as a source for their nerve supply. Abduction as a function, binocularly also, is the result of simultaneous innervation of six muscles, but this implies even more the nerve-muscle integrity of three different cranial nerves. The perfection of binocularity is in the final analysis even more—it is a conditioned cerebral reflex, a cerebral function.

Abduction and adduction in terms of a binocular function—that is, convergence and divergence—can be, and are not infrequently, lost. When these are lost they are the result of nuclear pathology (or even of supranuclear cortex changes) and have clean-cut characteristic ophthalmic symptoms. The same is true of a paralysis of left or right gaze, or even of vertical associated movements. Here, also, the ophthalmic syndromes of these conditions are rather cleanly cut with classical courses. These are seldom, if ever, the result of vague etiology, and their basic and accompanying characteristic findings are consistent. This must be so, considering their central-nervous-system control, normal as well as pathologic.

Ptosis as a syndrome of paralysis presupposes a partial third-nerve palsy, a cervical sympathetic paralysis, or both simultaneously involved. The degree of ptosis present, with certain other significant ocular signs and symptoms, is sufficient to decide which underlying nerve defect is at fault.

An acquired third-nerve levator palsy, no matter of how long standing, is not followed by a contracture of the antagonist; that is, in this instance the upper arc of the fibers of the orbicularis palpebrarum. Similarly, the lesser degree of ptosis, from a cervical sympathetic paralysis, would be spared such contractures. The occipitofrontalis in a true ptosis is raised, the eyebrow arched upward. In hysterical ptosis, however, the opposite occipitofrontalis, on the normal side, may be raised, or in the case of a contracture ptosis the eyebrow may be actually lowered on the apparent paralytic side. The orbitopalpebral fold is seldom ironed out as is seen in true ptosis, whether congenital or acquired. In true congenital ptosis, the upper lid seldom, if ever, follows the eyeball fully and normally downward, in strong downward rotation, as does the normal lid. The lower lid actually moves faster and with a greater disproportionate excursion; and this results in a widened palpebral fissure with strong downward gaze. In hysterical ptosis, the excursion of the upper lid, with downward rotations, is greater than normal. This can be seen in figure 1 as illustrated. Manual elevation of the ptotic lid in hysterical ptosis quite frequently results in resistance on the part of the patient. When the upper lid is lifted and then released the pseudocontracture or actual contraction of the orbicularis, in spasm, closes the lid with a crash. Careful examination may show, at this time, a simultaneous fibrillar contraction of the orbicularis fibers as they lie in the lower lid.

Fig. 1 (Spaeth). A, Unposed photograph in repose. B, Photograph taken when patient was instructed to look directly at the camera. Exposures for these photographs were all flash exposures. C, Illustrates the lack of response on the part of the patient, for she is being instructed to follow a moving finger.

The case to be presented is that of a girl aged 19 years, who, following a minor injury to the back of her head in an automobile accident, developed a bilateral ptosis, a suggestion of right conjugate deviation in repose, and a definite limitation of external, superior, and internal rotations—all in the left eye. The ptosis, however, was greater on the right than on the left. If this condition was truly organic it would mean a paralysis (paresis) of the left external rectus, the left superior and inferior recti, and with this a bilateral levator paralysis (or paresis) (superior branch of both third nerves) combined with an involvement of left associated concomitant gaze. Figure 1A and figure 2A illustrate her appearance when gazing left and the apparent right conjugate deviation. Figure 1A could show her attempt to escape diplopia from a paralytic external rectus on the left. If so, then the condition depicted in figure 2A would be quite impossible. Fixation, as here with a paralytic left eye, should result in a strong overconvergence in the right, as a secondary deviation; for in true fixation with the normal right eye

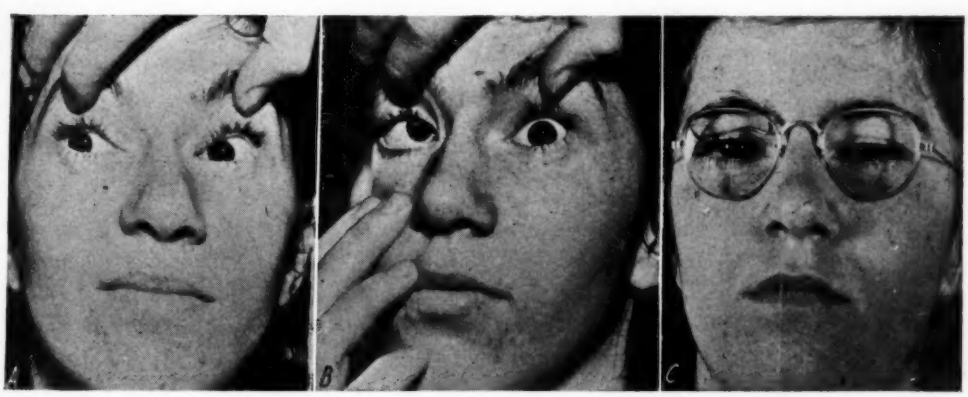

Fig. 2 (Spaeth). A, Manual elevation of the ptotic lids without instructions to the patient. B, The same thing. Patient instructed to look to the left. Illustrates the limitation of upper rotation in the left eye with a suggestion of overaction of the right inferior oblique. C, The patient in repose, both lids normal, eyes to the front while wearing but a single crutch to lift the right lid only.

the left would need to come to rest in a primary convergent squint, less in amount but manifest.

It was impossible for the case to be one of a pontine type of conjugate deviation, traumatic in nature, because of the irregularity and the inequality of the left lateral rotations. A pontine type of conjugate deviation, while minimal in amount, as compared to the cerebral type of deviation, is seldom if ever a sign of brain-stem irritation; is minimal in degree; is a permanent condition never compensated for; the oculomotor excursions (or absence of these) are symmetrical; and it is almost certainly accompanied by asymmetrical paralyses of associated muscles in consequence of the extension of a brain-stem lesion upward and supranuclear and downward to other cranial-nerve nuclei. The innervation of the levators is homolateral in each eye without crossing of the fibers; that is, without contralateral nuclear supply. This case would thus need bilateral organic lesions.

A true sixth-nerve palsy would be accompanied by diplopia and a secondary deviation. Neither of these was present, though repeatedly a transient diplopia could be picked up in the left lateral field.

A paralysis of the sixth nerve on the left with bilateral ptosis could not be organic in origin without manifesting other symptoms of brain-stem pathology. The classical internuclear syndrome of trauma was lacking entirely. Figure 2B shows the normal excursions with internal rotation of the right eye and the limitation of upper rotation as seen in the left eye. The homolateral brain-stem origin of the sixth nerve, the levator and the superior rectus, all on the left, is consistent with an organic situation, as an internuclear syndrome, but becomes immediately impossible when there is added thereto ptosis of the upper lid on the right with right-eye divergence; that is, with external rotation of the right eye in repose. The diagnosis of an intranuclear syndrome would necessarily presuppose that the ptosis present was purely right; hence, right-sided in the brain stem with an accompanying right internal-rectus incomplete paralysis, from involvement of the right-sided half of the fibers. This, however, did not answer the paresis of the superior rectus on the left, and the partial ptosis on the left, the innervations of which arise from the left brain stem. The apparent impairment of the external rectus on the left (see fig. 2B) was consistent with a possible left-sided pathologic change, and as such presupposes bilateral pathologic lesions around the aqueduct and in the internuclear connections between the third-nerve nuclei bilaterally and the levator and internal rectus on the right; and the levator with the superior rectus and the external rectus on the left. While these were truly bizarre, they still were possible. Unfortunately, this anatomic diagnosis broke down wholly in considering the observations made when the patient was recovering from an anesthetic (which will be discussed later) and the complete disappearance of all disturbances of extraocular motility when a single crutch lens was placed to lift the right lid (also to be discussed later).

Following the automobile accident, litigation was started by the patient in the case, but as no insurance was carried by the owner of the automobile the case was dropped from the courts. Three months after the onset of the condition the patient was admitted to the hospital for careful studies. The neurologic studies throughout failed to show any pathologic changes in the reflexes, in sensation, in posture, or in gait. No cerebellar sign was present. The Bárány showed a normal left hori-

zontal nystagmus, *although this could be the response of the entire adductor-abductor group, and not of a single muscle.* The results of spinal-fluid and X-ray studies were negative. The limitation of upward rotation on the left, in the field of the superior rectus, did, however, cause in left lateral rotation, a slight overaction of the right inferior oblique. A vague history was obtained from the mother that since early childhood the patient has had

Psychotherapy was attempted but was without definite results. The patient was given a crutch glass with one crutch only on the right upper lid. This resulted in the normal binocular opening of both palpebral fissures and there was in the next few weeks, a marked return in the degree of left external rotation.

When the crutch glasses were removed the patient again developed, immediately, the bilateral ptosis. It was suggested that

Fig. 3 (Spaeth). A and B, Patient after sudden recovery from all ptosis as well as from all other oculomotor disturbances.

for periods some type of oculomotor disturbance in one of her eyes. The patient herself denied this and it cannot be confirmed otherwise. If this is true, and it might well be so, it seems that the patient was utilizing a preëxisting oculomotor condition, though perhaps minimal in amount, as the basis for her conversion neurosis. It was, however, the only sign, even though so distant as to be almost impossible, of the only disease condition not wholly eliminated; that is, multiple sclerosis.

A facial-nerve block done on the right side gave quite inconclusive indications. The patient was then given a general venethene anesthetic. When recovering from the anesthetic she became quite voluble; both lids opened widely and normally and her ocular rotations were full in all directions, except for some slight limitation, in the horizontal, of external rotation on the left as compared to the normal extent of the rotations in the right eye to the right.

the crutch be taken from the right lens and placed on the left to see if the elevation of that lid resulted in a simultaneous elevation of the right. This was not done, however, for when the right lid was lifted manually, the left opened spontaneously and simultaneously. When the left upper lid alone was lifted the right lid continued ptotic.

Six months after her presentation before the Neurological Conference at The Graduate Hospital, and while still wearing her crutch glasses, the patient was happily married. She also continued employment in an arsenal, working in parachute packing. Her relationship with her mother-in-law became very satisfactory shortly after her husband was called into the armed service. One morning, after an unusually pleasant evening spent with her mother-in-law, the patient awakened in the morning, and to quote her, "she discovered that she could lift her lids normally and without the assistance of the crutch glasses." The patient reported to

the eye clinic on the same afternoon, and it was found that not only had the ptosis recovered completely, but also all of her other aforementioned vague and rather indefinite oculomotor limitations had disappeared (fig. 3A, B). The crutch was removed from the frame of the patient's glasses and she has continued since without any further complaint.

The points of interest, and hence of clinical importance are (1) the vague history of some preëxisting oculomotor disturbance; (2) the traumatic relationship etiologically; (3) the associated oculomotor disturbances without loss of vision, asymmetric in character and without constant characteristic diplopia or secondary deviation; (4) spontaneous correction of the bilateral ptosis when only one lid was lifted manually; (5) the absence of any other neurologic signs which might suggest pathologic changes in the brainstem; (6) the failure to obtain any improvement in the condition by suggestion therapy; (7) the sudden and dramatic recovery is almost certainly diagnostic of the underlying functional pathology; and (8) the case illustrates rather well an indefinite asymmetric situation probable when hysterical ptosis is considered as a pathologic entity.

Conclusion

An unusual oculomotor situation is presented as a posttraumatic manifestation. The diagnosis was considered to be hysteria, upon the basis of inconsistencies in the symptomatology and with neuroanatomic impossibilities. Time and subsequent findings proved this etiologic diagnosis. Up to the time of abrupt recovery the gross extraocular-muscle incongruities could not be answered upon an organic basis.

The condition as seen in figure 2C remained unchanged for eight months. There was no incapacity whatsoever as long as the patient wore her crutch lens. Without it, within a very few minutes, the patient reverted to the condition shown in figure 1A, B, C. The length of time intervening since the original presentation of this case and up to the present was an interval deliberately selected in the hope that differences in the situation might appear and permit a certain etiologic diagnosis. This interval was somewhat against the diagnosis of a functional state but not conclusively so. As stated, the patient now remains fully recovered.

1930 Chestnut Street.

THE EXOPHTHALMOS OF HYPERTHYROIDISM

A DIFFERENTIATION IN THE MECHANISM, PATHOLOGY, SYMPTOMATOLOGY, AND TREATMENT OF TWO VARIETIES

Part II

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B. THYROTROPHIC EXOPHTHALMOS

The association of hyperthyroidism with morbid conditions of the pituitary gland and the demonstration that an exophthalmic variety of hyperthyroidism follows the injection of an anterior pituitary extract has led to the opinion held today by not a few that exophthalmic goiter is the outcome of thyrotrophic activity. Criticism of this view is justifiable for several reasons of which two only will be mentioned; namely, that the presence of an excess of thyrotrophic hormone, constantly discernible in those conditions associated with an increase, has not been found in thyrotoxicosis, and, secondly, that the experimental type of proptosis resulting from injections of pituitary extract differs markedly in its main features from that of thyrotoxicosis. Thyrotrophic hyperthyroidism, however, occurs in more than one form in man, and of these one is accompanied by a type of exophthalmos as nearly identical as can be with the experimental variety alluded to above. The close similarity of these two types indicates strongly the probable pathogenesis concerned in the development of the human variety; hence the finding of an increased quantity of thyrotrophic hormone in the serum of patients with thyrotrophic exophthalmos forms a not unexpected item of corroboration.

Of confirmatory importance, too, may be added the difference in effect on the proptosis obtained by an injection containing thyrotrophic hormone into patients with exophthalmic goiter and thyrotrophic exophthalmos. In the former, the proptosis is unaltered; but in the case of the latter, a severe exacerbation may ensue. An illuminating account of such a mishap has been given by Stallard (1936). A middle-aged man, with features conforming to the thyrotrophic type of exophthalmos, was given a single injection containing 600 units of thyrotrophic hormone. Within three weeks a mild degree of proptosis was precipitated into the severe malignant variety, leading to the loss of one eye and marked damage to the other after a further short space of three weeks. Such a rapid sequence to a single injection of a thyrotrophic extract affords strong presumption that the measure reacted as part of the active pathologic process; hence it is interesting to learn that biopsy of an affected eye muscle disclosed the morbid changes characteristic of the thyrotrophic variety of exophthalmos.

General features of the disease. Before proceeding to a detailed description of the exophthalmos, a few remarks on some general aspects of the condition may be of interest. Thyrotrophic exophthalmos is not common but, including the more frequent mild varieties, is seen probably at least two or three times a year at most general or ophthalmic hospitals in this country. It is three or four times as common in males as in women and is most frequent about the time of the menopause, the average age among 22 males and 6 females being 54 and 47 years, respectively, a feature which illustrates rather well the tendency of the climacteric to arrive nearly a decade later in men.

The disease presents two main characteristics, hyperthyroidism and exophthalmos. Both of these features may be well marked or only slightly developed, or either one predominant. As a rule, the primary cases show a preponderance of one or other factor so that many patients

Fig. 14 (Mulvany). Thyrotrophic exophthalmos. Note clinical resemblance to cavernous-sinus thrombosis. Autopsy disclosed a tumor of the pituitary body (Würdemann and Becker, 1905).

operated upon for hyperthyroidism show only a slight exophthalmos, or, conversely, the patient may attend the ophthalmic department with little evidence of hyperthyroidism. An average rise of basal metabolism would fall between +30 and +40 percent, but the writer has encountered instances varying from +4 to +75 percent. With a low grade of hyperthyroidism there may be doubt as to diagnosis, and in certain instances with a pronounced proptosis and doubtful hyperthyroidism, orbital neoplasm or an ophthalmoplegia of obscure character may be diagnosed. The majority of cases labeled exophthalmic ophthalmoplegia are instances of this syndrome. Occasionally the severe degree of exophthalmos with its accompanying edema and evidence of retrobulbar congestion has created the impression of a thrombosis of the cavernous sinus (fig. 14). In 1938 two such cases were seen, one having been designated idiopathic aseptic because the patient made a partial recovery and the other chronic because the condition remained more or less stationary for two months until death occurred from pulmonary embolism. Many instances, however, are of a mild character, and the patients in these circumstances have attended for a long period the various departments of a hospital without receiving a definite diagnosis.

One other point calling for reference is the tendency to spontaneous arrest and sometimes remission of the disease. Many of the early or mild cases never progress beyond the first stage, and the writer has under his care two cases in which the condition has been stationary for 6 and 10 years, respectively, the B.M.R. in the latter having ranged from +15 to +40 percent during this period without general ill effect. In the more vigorous type of case, a spontaneous halt may also occur but seldom before some form of treatment, usually a thyroidectomy, has been carried out. The operation invariably removes the hyperthyroidism, but in a good proportion of cases the proptosis is accentuated, owing to the stimulus to the pituitary gland provided by the removal

Fig. 15 (Mulvany). Thyrotrophic exophthalmos before and after thyroidectomy (Andersson, 1932).

of the thyroid gland (fig. 15). Grave complications may follow, requiring some

form of orbital decompression, but even in this severe type of case, as mentioned by Naffziger, the tendency to steady improvement over a period of years still remains.

Observations on possible pathogenesis. Earlier it has been suggested that the essential components of the pathogenesis comprise the coincident presence of increased quantities of the thyrotrophic hormone and certain sterones, in particular testosterone.

The actual mechanism accountable for the pathologic changes in the eye muscles is obscure, but it is possible that the specific effect on striped muscle of the male hormone and maybe of other sterones is altered by the thyrotrophin. The characteristic action of these substances on muscle tissue is well known. It may be recognized in the muscular hypertrophy accompanying virilism or resulting from testosterone administration. Generalized in effect, there is often a disposition to excessive activity at certain sites. A good example of this local response is seen in the bulk of the temporal muscle of the guinea pig, normally large enough to service as a sex-distinguishing feature, which is markedly reduced after castration to reappear on androgen replacement. Another local effect of possible importance is an alteration in water content. This is best illustrated by the swelling of the capon's comb, mainly due to increased water content, in response to androgen. The phenomenon is on a par with the local edema of the vulva produced in monkeys by estrin which may spread to the muscles of the gluteal region and back; although it is doubtful whether the estrogens are in any way concerned in the production of thyrotrophic exophthalmos.

The examples are given to show that it is biologically possible for certain hormones to exert a marked effect both on the metabolism and water content of striped muscle, the exact significance of which will be better appreciated in connection with an analysis of the pathologic changes in the ocular muscles. In men the source of the sterone is obvious but in women, particularly after the menopause, its origin is less certain. It is possible that in the postmenopausal era the adrenal cortex produces an effective substitute, and in earlier epochs the position of progesterone has to be determined. The prospect suggests a fruitful avenue for exploration.

I. Mechanism of thyrotrophic exophthalmos

In this condition the mechanism is straightforward and simple, consisting of an increase of retrobulbar pressure as a result of which the eye is pushed out of the orbit. The rise in tension is brought about by a peculiar type of pathologic change in the eye muscles leading to great enlargement, which, taking place within the bony confines of the orbit, necessarily causes protrusion of the globe. The process is progressive but may be very slow after the initial push, little further proptosis taking place over a period of several years. Other cases less deliberate in development are more severe, owing to the orbital contents having to accommodate themselves more rapidly to the increasing muscular bulk. Part of the enlarging mass expands within the extraocular cone at the expense of the fat, which is often reduced in amount and may be absent. The main effect, however, is felt on the rear of the globe and periorbital septum, leading to proptosis and fullness of the lids. Later palpebral and conjunctival edema ensues due to compression of the venous arcades at the base of the lids, where the vessels undergo a hairpin bend (fig. 16). Following this the lids become more tightly apposed to the corneal surface and their increasing tension resists the forward movement of the eye. The intraorbital pressure rises rapidly, causing the establishment of a vicious circle so obstinate that it is seldom resolved by anything less radical than a full orbital decompression. More particularly is this

so when the main venous return has been obstructed, for generalized edema of the orbital contents may then supervene. However, this complication is not so common as might be expected.

Hyperthyroidism plays no part in the mechanism. This is shown as much by the number of cases that progress or appear to develop after a thyroidectomy as by the experimental finding that the proptosis is

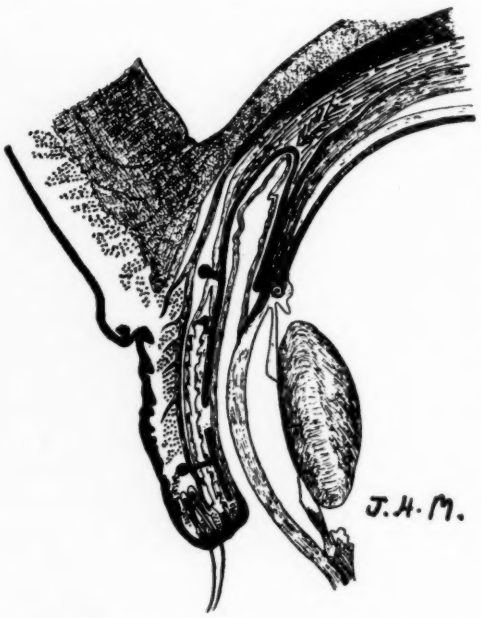

Fig. 16 (Mulvany). Upper eyelid. Schematic representation showing acute bend of palpebral vessels in region of upper fornix (after Duke-Elder, 1938).

produced more rapidly, more prominently, and with greater ease in animals previously thyroidectomized. Conversely, it has been shown that the administration of thyroid tends to reduce the efficacy of the thyrotrophic injection. It is evident that the postthyroidectomy facilitation is connected with the stimulus to hypophyseal activity induced by the operation.

Further, there is no evidence, either experimental or clinical, to implicate the sympathetic nervous system in the production of thyrotrophic exophthalmos. In guinea pigs, Smelser (1937) has shown that resection of the cervical sympathetic ganglion does not prevent nor alter in any way the proptosis induced by injections of anterior pituitary extract. In man, also, the absence of features pointing to sympathetic involvement is noteworthy, and there is on record a description of the proptosis developing in a case of paralysis of the cervical sympathetic (Brain, 1939). Although considered to be a case of Graves's disease, the related clinical effects indicate the thyrotrophic nature of the condition. Items such as the onset after the gonadothyrotrophic stimulus of pregnancy, the story of lacrimation, the glassy appearance of the conjunctiva, the puffiness or fullness of the lids, the retraction of the upper lid in the absence of sympathetic spasm, the small enlargement of the thyroid gland, and the remission consequent to medical treatment are findings as unusual in thyrotoxicosis as they are usual in the thyrotrophic syndrome. The association of syringomyelia with paralysis of the cervical sympathetic induced Brain to conclude that the integrity of this nerve was not necessary for the development of exophthalmos in thyrotoxicosis, although this view is contrary to the general belief; whereas it seems more probable that the case afforded clinical corroboration of the experimental findings that an intact cervical-sympathetic nerve is not necessary to the development of the thyrotrophic variety of exophthalmos.

II. Pathology of the Eye-Muscle Changes in Thyrotrophic Exophthalmos

The features of this morbid process, first described in detail by Burch (1929) and Naffziger (1933), contrast sharply

with the thyrotoxic pathology. The pathologic change is governed by four main elements; namely, a special type of muscle degeneration not marked by nuclear reduplication, a heavy increase of perimuscular and interstitial fibrosis, the presence of edema, and generalized round-celled infiltration. The degree of development of these four factors is variable in each case, but their sum total results in enlargement of the eye muscles. The increase in size is variable and may be gross, instances being on record in which the normal circumference of 8 to 10 mm. has been extended to 60 to 70 mm., causing the muscles to resemble "young cigars" (fig. 17). The increased volume leads to bulging of the orbital contents when the cavity is opened, affording a contrast to the flabby muscular attenuation of thyrotoxicosis. Alteration in color and consistence is prominent. The healthy appearance is converted into a pale and grayish hue and the normal soft structure replaced by a hard rubbery substance which causes the muscles to creak on section. Sometimes, as Naffziger has pointed out, the muscles may be darker than normal, probably denoting a slower and more fibrous development. Although of greatest extent in the eye muscles, the muscle disturbance is probably generalized, as Paulson (1939) has shown to be the case experimentally. It seems, as in thyrotoxicosis, that the eye muscles again are prone to be affected in greater extent than those elsewhere.

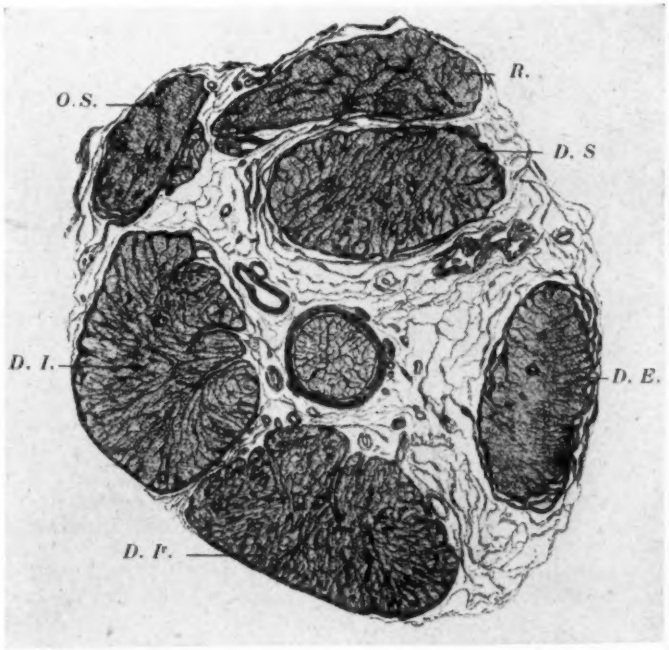

Fig. 17 (Mulvany). Thyrotrophic exophthalmos. Transverse section of orbit showing gross enlargement of extraocular muscles. Edema and heavy fibrosis are clearly evident (Rochon-Duvigneaud and Onfray, 1906).

Details of the changes may be considered under the headings of the four main processes operative within them:

a. The process of fibrosis. This feature, predominant in the slower type of case, is responsible for the hardened consistence of the muscles. It appears to develop in two main ways, either as a fibrous conversion of the sarcoplasm or as an expansion from the fibrous tissue within the vicinity. Both methods are of importance but not equally so, for it is apparent that the former, spreading slowly along the length of the muscle fiber, is likely to be asso-

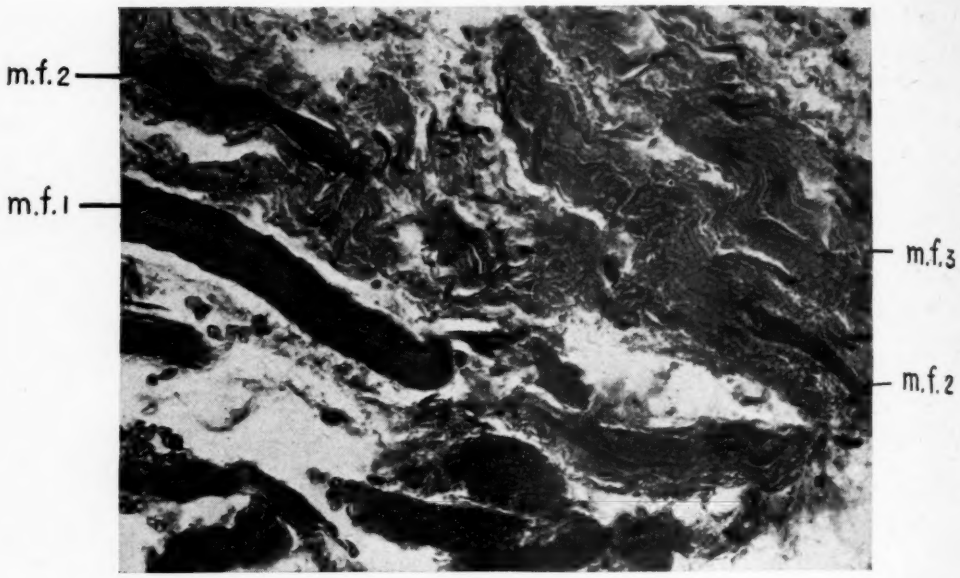

Fig. 18 (Mulvany). Eye muscle from case of thyrotrophic exophthalmos, showing fibrous conversion of muscle fibers. Almost normal muscle fiber (m.f.1), partially converted muscle fiber (m.f.2), completely altered muscle fibers (m.f.3).

ciated with a slower and lower grade of ocular disturbance. The diffuse fibrous expansion, on the other hand, is more serious, for there is greater swelling of the muscles due to edema, more impairment of eye movement, and a higher retrobulbar pressure.

Fibrous conversion of the sarcoplasm, although not peculiar to this disease, is often well developed. Starting, as a rule, at the base of a fasciculus, it spreads along the fibers until the whole length is involved (figs. 18, 19). Sometimes the fibrosis jumps ahead, leaving a gap of fairly normal tissue, or else it may appear in the center of a fiber and spread in both directions. The sarcolemma is affected in similar fashion.

The diffuse type of fibrous expansion involves the perimuscular and interstitial tissues. The perimuscular spread is coarse, being mostly fascicular and keeping to the broad outlines of

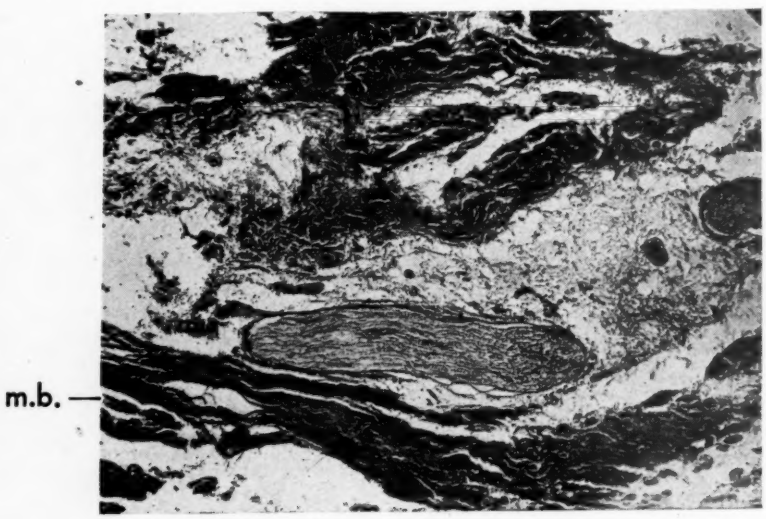

Fig. 19 (Mulvany). Thyrotrophic exophthalmos. Eye muscle showing fibrous conversion of muscle bundles (m.b.), edema, and some slight round-celled infiltration.

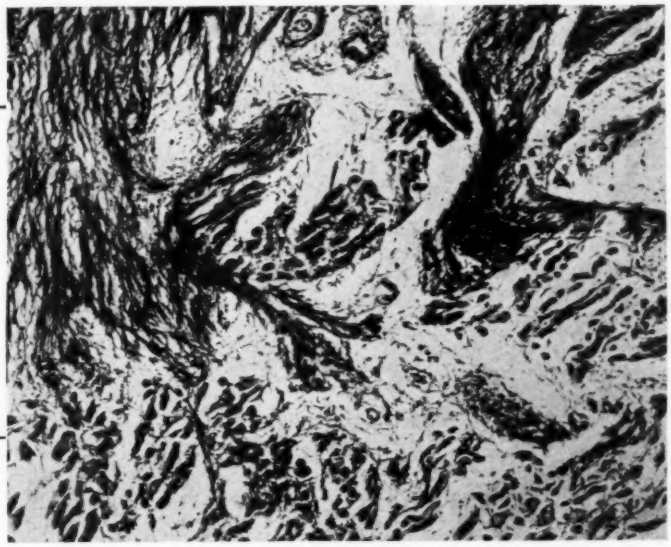

Fig. 20 (Mulvany). Thyrotrophic exophthalmos. Eye muscle showing heavy perimuscular fibrosis (f.), edema of muscle fibers (m.f.) and interstitial tissues, and one small area of perivascular cellular spread.

the bundles, but numerous ramifications pass inward between the individual fibers (fig. 20).

At the same time a delicate fibrous network is developed transversely between the individual fibers, being derived from scattered fibroblasts some of which originate by metaplasia of disintegrating sarcolemmal cells.

As a result of the intimate investment of the fibers, the swollen contour of the muscle is retained and may even increase after complete absorption of the sarcoplasm, owing to the effective retention of the edema within the fibrous compartments. The end result, if the patient survives the associated ill effects, is one of diffuse fibrosis of the retrobulbar tissues, which become fused into a conglomerate mass in which all trace of muscle tissue is lost save to microscopy, whereby a few scattered fragments may be detected (fig. 21).

b. The process of edema. Although this feature is constant, being present in all sections of biopsy material from eight cases, its development in most instances probably represents a later stage than the fibrosis process. This would appear to be so for at least three reasons. First, many cases are of mild character and long duration whereas others undergo spontaneous arrest. This type of progression is not suggestive of a mechanism based upon an edematous process even though the fluid may

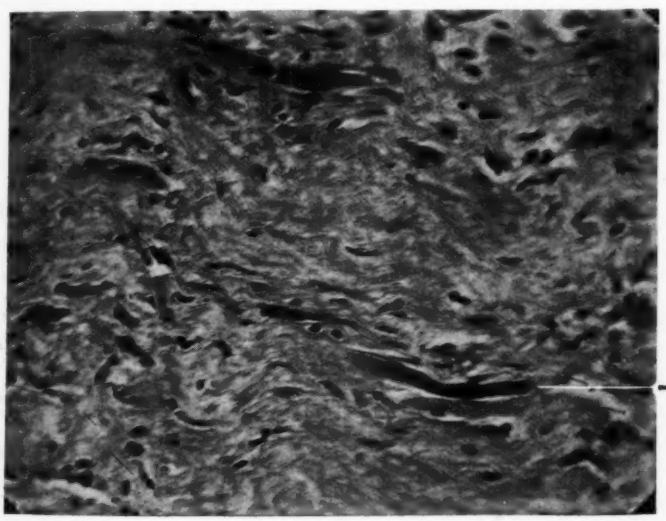

Fig. 21 (Mulvany). Thyrotrophic exophthalmos. Portion of orbital contents consisting of fibrous tissue containing few remnants of muscle tissue (m). Clinically, appearance suggested cavernous-sinus thrombosis.

Fig. 22 (Mulvany). Thyrotrophic exophthalmos. Eye muscle showing dissolution and absorption of muscle fibers. Note dark bands due to areas relatively more resistant to absorptive process.

be very thick. Second, areas affected by edema often contain portions of muscles showing advanced fibrous change in the course of disruption, suggesting that the slower fibrotic process has been overtaken by edematous infiltration. Third, evidence of fibrosis without edema has been noted but the converse is rare, although Smelser stated that fibrosis was not marked in his series. It is certain that the fibrosis is less likely to be highly developed in the acute primary case and in the experimental variety when the proptosis appears in a few weeks: changes resulting in rapid swelling and distintegration achieve by speed what the fibrosis does in time.

Whatever the primary cause of the edema may be, its development is probably aided by lymph stasis. The diffuse fibrous investment of the muscles interferes with their lymphatic drainage, which is further obstructed by the disruption of the various fibers and bundles. This obstruction accentuates the swelling of the muscles and leads to more retardation of the lymph flow. The vicious circle thus started is sometimes aggravated by pressure of the enlarged muscles on the main venous ophthalmic return.

c. The process of muscle-fiber degeneration. The earliest change frequently appears to consist of slight swelling and loss of transverse

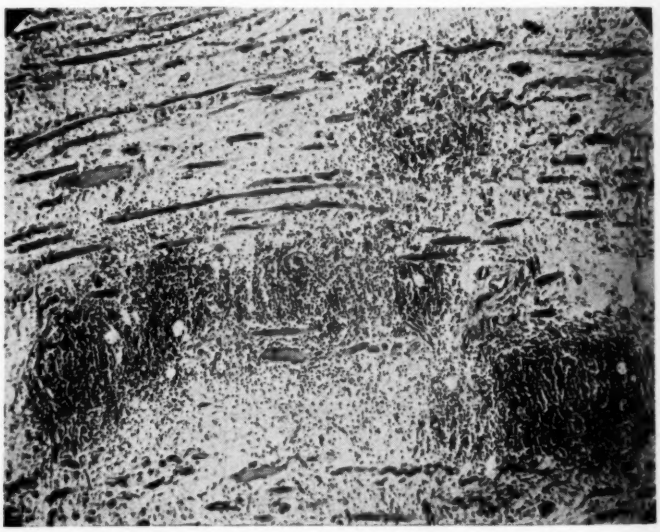

Fig. 23 (Mulvany). Thyrotrophic exophthalmos. Eye muscle showing edema, marked round-celled infiltration, and absorption of muscle fibers.

striation (figs. 18, 22). Although widespread, loss of this striation is occasionally absent and cross markings may be decipherable when the fiber is in the last stages of destruction. Later changes depend upon the dominant factor of the morbid process which may be either fibrosis or edema. The latter appears to accelerate the degeneration of the fibers. The sarcoplasm assumes a fibrillary appearance and fragmentation is common, sometimes occurring at several places simultaneously in a single fiber (fig. 23). Absorption of the muscle protoplasm is progressive but irregular, often leaving bands of darker hue due to areas of relatively unabsorbable material along the course of the fiber (fig. 22). As absorption proceeds, the fiber becomes paler and more transparent until the sarcoplasm completely disappears. In certain areas the sarcolemma survives the destruction of its contents, but usually its disintegration is coincident with, and may anticipate, that of the fiber proper. Sometimes, fusion of contiguous sheaths may create the impression of nuclear reduplication. After absorption, the original site of the fiber can often be made out by the persistence of its fine fibrous investment.

d. The process of round-celled infiltration. This feature, most abundant where there is edema, consists predominantly of a lymphocytic infiltration. The cellular exudation is most marked in the neighborhood of the vessels and may be excessive, resembling in intensity the extravasations found with lymphatic leukemia (fig. 23). The vessels from which these cells are derived are often engorged and may contain an abnormally high percentage of lymph cells, as if in preparation for extrusion. Red cells may be abundant in certain areas and are not the result solely of trauma, as they are intimately mixed with the white cells. Small to moderate numbers of plasma cells are also present, and a few phagocytes, dealing with degenerated portions of muscle fibers, may be visible.

e. Other orbital structures. The other tissues of the orbital space may undergo little change. In the first patient operated upon by Naffziger, it was noted that the contents of the muscle cone were compressed into the smallest dimensions, the fat apparently being absent. In certain advanced instances, the orbital fat may become edematous and infiltrated by round cells. The chemosed conjunctiva contains plasma and polymorphonuclear cells with relatively few lymphocytes.

The lacrimal glands, as in experimental thyrotrophic proptosis, generally show marked changes. Reese (1935) in two postthyroidectomy cases noted the glandular tissue to be in all stages of degeneration, being affected by fibrosis and edema with lymphocytic infiltration. In certain areas, the lymphocytes gave rise to foci of considerable size, and the picture resembled the pathologic changes occurring in the muscles. The orbital tissue between the gland and the muscles was apparently normal. In the experimental variety, Paulson (1937) found the alveoli of the lacrimal gland to be abnormally dilated with large areas of degeneration as shown by nuclear break-up, pyknosis, and vacuolation of the gland cells. Fibrosis was obvious and in many cases sustained the architecture of the gland after the disappearance of the secretory cells. Clinically, enlargement of the lacrimal gland, as noted by Naffziger, may be a prominent feature, being easily palpable to the inquiring finger.

The larger vessels and nerves escape involvement. The smaller terminal vessels to the muscles and lacrimal glands are engorged and may be edematous, but are not inflamed. The smaller terminal nerve twigs are affected by the muscle edema and undergo absorption; the larger branches are resistant to the degenerative process.

Summarizing, it may be said that the four elements of the pathologic process as outlined above together with the absence of nuclear proliferation of the muscle sheaths constitute a complete contrast to the morbid process of thyrotoxicosis.

III. Symptomatology of thyrotrophic exophthalmos

It would be surprising in two conditions whose main features comprise hyperthyroidism and exophthalmos if

their points of resemblance were not on occasion to render differentiation somewhat difficult. Yet, concerning the proptosis, this should not be unduly prominent except in certain early, mild, or slowly developing instances of the thyrotrophic variety, when it is often less a matter of discrimination than of deciding whether any abnormality exists.

In general, three stages in the evolvement of the ocular manifestations may be recognized (fig. 24): (a) The first stage, which may be termed the incipient, occupies the phase in which the proptosis takes place as a result of the gradual enlargement of the eye muscles without much rise of the intraorbital pressure. (b) The second or ingravescent stage, marked by congestion and edema and a steady progression in severity, follows a general rise of intraorbital tension. (c) The third stage, appropriately termed the "malignant," is characterized by the onset of corneal ulceration followed by loss of the eye unless relieved.

Fig. 24 (Mulvany). Thyrotrophic exophthalmos showing incipient, ingravescent, and malignant stages of the process. The second and third stages occurred three and seven months after thyroidectomy (Merrill and Oaks, 1933).

The first stage is variable in its appearance and duration. Commonly it varies between one and two years but instances are on record of the severest phases having developed within six months [Merrill (1924), Smelser, personal communication]. In the case reported by Stallard (1936), a mild stage 1 was converted into the malignant third degree within a matter of three weeks following a single injection of thyrotrophic hormone. On the other hand, the first stage may last several years as recorded by Pletneva (1932), who describes a case in which a period of 10 years passed before the development of the congestive phase and subsequent loss of one eye. The writer has under his care two cases of 6 and 10 years' duration, respectively, during which interval the condition of the patients has varied very little. It seems that some of the milder types never progress beyond the incipient phase, a characteristic which may depend on the tendency of the disease to assume a stationary turn.

The second or ingravescent stage develops in response to a material rise of intraorbital tension. It is steadily progressive and generally lasts from a few weeks to a few months. The increased severity locally is not necessarily associated with any change in the general condition of the patient but is accompanied by evidence of local circulatory disturbance and incoördination of ocular movement. The precipitating agent is probably found in the compression of the venous arcade at the base of the lids by the pressure of the prolapsing orbital septum and the enlarged muscles behind it. Edema of the lids and conjunctiva follows, and pain may become a distressing feature.

Progression of the proptosis into the third or malignant stage is usually inevitable when the preceding phase is not checked. The ulcerating process is accompanied by severe pain and leads fair-

ly rapidly to perforation and panophthalmitis with consequent loss of the eye. Rarely, at this late juncture, spontaneous improvement may be noted; it is due possibly to the lowering of the intraocular pressure following rupture of the cornea and to the apparent tendency of the condition to subside if given a chance to do so.

THE OCULAR MANIFESTATIONS. Possibly the most singular clinical feature is the tendency of the proptosis to develop more prominently on one side than on the other, so that early cases may appear to be unilateral. In most instances this one-sided appearance is more apparent than real, for it is usually possible by means of the scleral test to detect the presence of a slight degree of proptosis on the seemingly normal side. The other clinical features are mainly subjective, although fullness of the lids not due to edema is fairly constant. They may be considered under the grouping of symptoms and signs.

Symptoms. These are five in number and may be present in any combination. In mild cases, the condition may be symptomless at the start.

1. *Pain,* which may be absent, is of two types: (a) A throbbing, aching, or burning sensation behind the eyes or sometimes just a feeling of retrobulbar uneasiness. Characteristically, it is worse in the mornings and is a fairly common feature. (b) An intense form of ophthalmic neuralgia referred to the supraorbital and infraorbital regions, more commonly the former. Attention was first drawn to this distressing complication by Stellwag (1869) in a patient reputed to have Graves's disease; he had severe pain in the forehead coupled with dilatation of the ciliary veins and a baglike swelling of the lower lids. The pain is probably due to the high intraorbital tension but also accompanies the perforating process. So intense may it become that morphia may fail to give relief and its uncontrollable nature has on occasion formed the main indication for enucleation.

2. *Lacrimation,* a frequent and troublesome feature and sometimes constituting the most prominent symptom. It does not depend upon exposure, as in exophthalmic goiter, for it may form the earliest item to be noted. Its origin probably depends upon a disturbance of the secretory activity of the lacrimal gland, which pathologically shows gross changes and clinically may be palpable. Naffziger noted its enlargement in four out of eight cases.

3. *Photophobia,* a less common but rather irritating feature. Artificial light is resented more than sunlight and the discomfort may cause the patient to change his occupation if nocturnal.

4. *Diplopia,* less usual as an early symptom but by no means a late accompaniment. Characteristically, it is most evident on looking obliquely upward and is constant in position although increasing in severity with the progress of the disease. A definite squint is rare, and it is only in the late second or third stages that some loss of parallelism of the ocular axes may occur. It is not improved by rest, being often worse on awaking, but improvement tends to follow during the day. In mild cases, the disability may be overcome and fusion accomplished. The administration of prostigmine is without effect. In respect, therefore, to its constancy of position, its lack of improvement after rest or prostigmine administration, to the rarity of strabismus and the tendency of the disturbance to affect upward rather than lateral movement, the diplopia presents noticeable differences from the disturbance of eye movement in thyrotoxicosis.

5. *Difficulty in convergence,* a less frequent symptom but one which may be the first to cause the patient to seek advice. Examination usually shows that this fea-

ture is associated with some other defect of muscular coördination.

Physical signs. 1. *The proptosis,* early and constant, yet often slight and difficult to define unless the scleral test is accurately applied, is not uncommonly of unequal development on the two sides. Slow in appearance in the mild case, progress may be rapid in the postthyroidectomy patient when an advanced state may be reached within a few weeks of the operation. In the primary forms also a fairly rapid progression may sometimes be noted. Thus, in a case of Smelzer's, one eye was lost within five months of an onset consisting merely of fullness and lacrimation; on the other hand, a slight degree of proptosis may have existed for several years before an accentuation of the process takes place. In other instances, the proptosis may become stationary in the first stage. Three other points require mention in this connection. One is the extreme degree of proptosis which may occur in the advanced case and which greatly exceeds that seen in exophthalmic goiter. Thus, Naffziger mentions the figure of 34 mm. in one of his patients, and the writer has seen one with 28 mm. and 30 mm. of exophthalmos. Another point, and a characteristic one, is the sensation of resistance encountered on attempting to assess the retrobulbar tension. In all cases this is above normal, but in advanced instances the pressure behind the globe may be so marked that one gains the impression of squeezing a knob embedded in cement. The maneuver is resented by the patient. Lastly, the swollen lacrimal gland and the insertions of the enlarged recti muscles are often palpable or visible. In thyrotoxicosis the lacrimal gland is never swollen, but the insertions of the voluntary muscles may sometimes be seen, and in extreme cases, as noted by Basedow, may divide the globe into quadrants like cords around a bale of goods, particularly if associated with a lowered tension consequent to intraocular perforation.

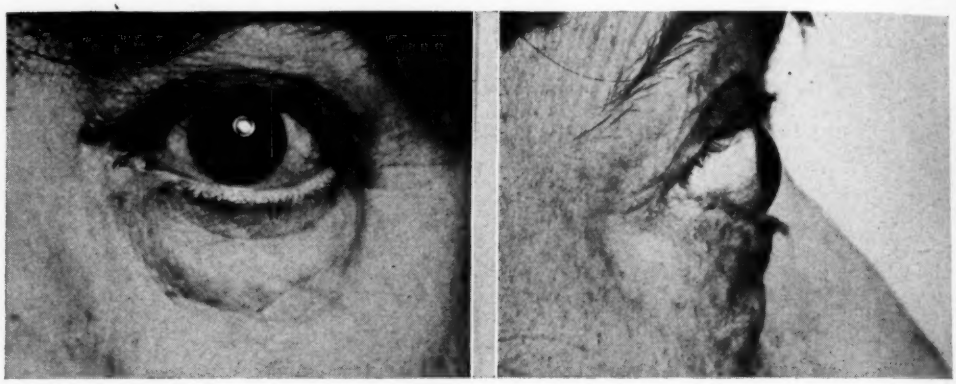

Fig. 25 (Mulvany). Thyrotrophic exophthalmos. Incipient phase stationary after six years; 24 mm. of proptosis. Note how absence of lid spasm tends to mask degree of protrusion of globe when viewed from in front.

The proptosis differs from that of exophthalmic goiter in at least seven important respects: a, The *presence of subjective phenomena* as outlined above. b, The *unequal development* of the proptosis which is not infrequent. c, The *absence of lid spasm,* permitting free eversion of the lids. d, The *degree of proptosis* which, owing to the absence of lid spasm, is more real than apparent in

contradistinction to the thyrotoxic variety which, owing to the width of the palpebral fissure, is often more apparent than real (fig. 25). e, The *sensation of hard resistance* in estimating the retrobulbar tension. In thyrotoxicosis, the eye can usually be pushed back into the orbit by firm pressure although it quickly returns to its former position on being released. Even in longstanding cases the resistance although firm is never marked by the stony hardness of the thyrotrophic variety and the examination is not painful. Clinical evidence of increased retrobulbar pressure is often associated. f, The *presence of congestive features* manifested in the earliest phase by a peculiar glistening of the ocular conjunctiva and the presence of a fine network of venules over its surface. Both of these factors are probably caused by a restriction of venous and lymph return made through the anterior ciliary vessels linking up with those of the fibrosing recti muscles (figs. 25, 26). Edema of the lids and chemosis never occur in exophthalmic goiter except as an accompaniment of an infected keratitis. g, The *rarity of dislocation of the globes* in front of the lids, the explanation lying in the dissimilitude of the respective proptotic mechanisms. In thyrotoxicosis. the proptosis and lid retraction are conjoined expressions of a single process each of which favors the development of the other so that high degrees of exophthalmos, apart from ptosis, are associated with wide lid retraction which may nearly reach the equator of the eye. In these cases, any movement such as sneezing, coughing, or jerking of the head may easily produce forward luxation, owing to lack of tonic retraction of the voluntary muscles. In the thyrotrophic variety, the palpebral tissues are often pushed forward with the globe and in any case their retraction behind the globe is effectively prevented by the swelling and stiffness of the eye muscles.

Fig. 26 (Mulvany). Thyrotrophic exophthalmos. First stage of proptosis showing characteristic glistening of conjunctiva and fine vascular congestion.

2. *Upper-lid retraction,* an early feature in the course of the disease. Its appearance has no connection with sympathetic activity as its development experimentally in the thyrotrophic type is not prevented by section of the sympathetic nerve in the neck; nor with hyperthyroidism, as this is often absent. Its presence is due to a mechanical disturbance of the normal relationship of the upper lid to the globe brought about by pathologic change in the orbit and particularly in the levator palpebrae. Normally, as pointed out by Pochin (1938), the upper lid possesses an accommodating power of stretching so that its relationship to the globe is but little disturbed by a simple exophthalmos up to 10 mm. In thyrotrophic exophthalmos this power of

accommodation is lost, owing to loss of elasticity in the levator muscle. Hence, as the swelling of the voluntary cone of muscles displaces the levator upward, the muscle is affected by a relative shortness, owing to fibrosis and its fixation posteriorly. Thus, minor degrees of thyrotrophic proptosis are often accompanied by upper-lid retraction. Later, as the orbital septum is prolapsed into the lid and edema supervenes, retraction bewith increasing upper-lid retraction. Some diminution of lateral movement is generally apparent about this time, but downward motion seems little altered.

The constancy of the association of loss of upward movement with upper-lid retraction invites an explanation. One may be found in the mechanical frustration of individual mobility of the swollen levator and superior-rectus muscles through their being conjoined in a good

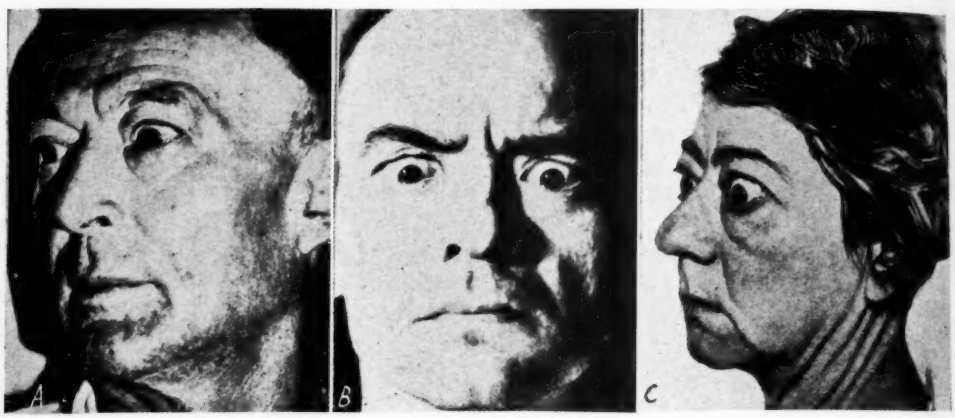

Fig. 27 (Mulvany). Thyrotrophic exophthalmos. Pathognomonic appearance often apparent at commencement of second stage: A (Thompson and Woods, 1936); B (Shannon and Gouterman, 1936); C (Naffziger, 1938).

comes less noticeable and may even be replaced by a pseudoptosis due to swelling of the lid.

3. *Disturbance of muscular co-ordination,* readily understood from the nature of the pathologic change, is often an early accompaniment. Possibly the first indication of this is an exaggeration of the curious nystagmoid oscillations normally associated with eye movement when following a rapidly moving object. Next, a restriction of ocular mobility occurs, usually affecting elevation in the first place although a slight reduction of extreme lateral movement may also be noticeable. Later in the first stage, upward movement becomes greatly affected and may be lost usually in conjunction part of their course, posteriorly by their origin from a common stem and anteriorly by an intimate fascial connection between the two tendons. The remaining orbital muscles, although greatly enlarged, are able to retain independent action for a much longer period, probably until their increasing girth has given rise to great increase of intraorbital tension or to mechanical hindrance locally. Thus it may happen that toward the end of the first stage the exophthalmos acquires certain characteristics which constitute a truly pathognomonic picture (fig. 27). The patient appears with a moderate proptosis, evident retraction of the upper lid, and slight depression of the globe owing to loss of upward movement. Full-

ness of the palpebral folds and evidence of increased retrobulbar pressure are usually associated.

The degree of limitation of eye movement appears to be related as much to increasing intraorbital tension as to the interstitial break-up and edema of the muscles. With chemosis, the tight application of the lids to the global surface is probably also a factor. Ultimately, complete immobility ensues, the mechanical basis of which is shown by the rapid return of eye movement following orbital decompression. The improvement is seldom perfect in these severe cases and in rare instances may be negligible, owing to the extent of the pathologic change in the muscles. In one case, the retrobulbar tissues were converted into a conglomerate fibrous mass containing only minute fragments of muscle tissue.

The nature of the disturbance of eye movement, partly mechanical, partly due to local muscle disease, is clearly not produced by a lesion of the central nervous system nor of the local oculomotor mechanism; hence the undesirability of terming it an ophthalmoplegia. In this respect the loss of eye movement differs from that occurring in exophthalmic goiter, which, in the full sense of the word, is a true ophthalmoplegia.

4. *Local vascular alteration* first makes its appearance as a fine network of venules in the ocular conjunctiva, particularly in the fornices, the surface of which assumes a curious but characteristic glistening character not seen in thyrotoxicosis. The conjunctival changes are accompanied by a bagginess of the eyelids, particularly of the lower, which at this stage is caused not by edema, but, as in thyrotoxicosis, is due to prominence of the palpebral tissues consecutive to the proptosis. As the congestive phase develops, a true edema of the lids and conjunctiva appears due to venous palpebral obstruction and not to waterlogging of the retrobulbar tissues, as Charpy (1931) has shown, by means of injections into the retrobulbar and intracapsular spaces, that liquid does not diffuse through to the lids.

The onset of these edematous changes adds greatly to the seriousness of the local condition, as it impedes closure of the lids. It is then only a matter of time before corneal ulceration of the progressive and irresistible type follows. Congestion and swelling of the optic disc, often with retinal hemorrhages, is also found and is due to direct pressure of the swollen muscles on the optic vein. Its association is variable and it may be absent in certain severe instances. Retinitis pigmentosa has been described by Zimmerman (1929). Provided pressure is relieved before vision has completely failed, a good recovery may be expected, although in severe and long-standing cases some degree of optic atrophy may follow. Complete blindness due to this cause is rare. The interval between the papilledema and optic atrophy is generally a few months, but in one instance (Pletneva, 1932) it ended 14 years after corneal ulceration had resulted in the loss of one eye.

IV. Treatment of thyrotrophic exophthalmos

General measures calculated to reduce the thyrotrophic and gonadotrophic output of the pituitary gland comprise direct and indirect methods.

The simplest direct measure is the employment of X-ray radiation, and its application as in acromegaly will result in a variable degree of improvement. For instance, a woman, aged 72 years, with two years' history received a dosage of 1,500r units over a period of 10 days. By the end of treatment, the patient had lost her diplopia and on discharge showed

a fall in the B.M.R. from +54 to +26 percent, a drop in the pulse rate of about 30 beats a minute, and a marked general improvement which was maintained six months later, since when the patient has not been seen. On the other hand, a man, aged 54 years, with a four years' history of proptosis and a slight metabolic rise varying between +24 and +15 percent showed only a slight fall of some 10 points in the basal metabolism and but small change in the exophthalmos on a similar dosage of the X-ray. It seems likely, particularly in regard to the proptosis, that the best result may be expected in the acute types on account of the lesser development of fibrosis in the eye muscles.

Indirectly, the secretory activity of the pituitary may be influenced by the administration of various substances of which the most practical are thyroid extract and iodine. In connection with thyroid activity, it has been shown by Marine, Rosen and Spark (1935) that the giving of iodine to rabbits affected with a parenchymatous goiter causes a decrease in the size and number of active cells in the pituitary gland which are probably concerned with the thyroid enlargement. Iodine medication, however, had no effect on the activity of the cells in rabbits previously subjected to a thyroidectomy, an observation in accord with the finding that iodine has little or no effect on the progressive exophthalmos following this operation.

In this connection it should be remembered that not all cases of postoperative ocular disturbance are indicative of hypophyseal dysfunction, as some of them denote a recurrence of toxic goiter. Thus Zimmerman (1929) describes eight cases of exophthalmos following operation for the relief of hyperthyroidism. Of these, it seems probable from the data that four cases, all in males with ages from 37 to 53 years, were examples of thyrotrophic exophthalmos. The remainder, all in women, were more probably instances of exophthalmic goiter. In two of this latter group, mention is made of the use of iodine, and it is interesting to note, apropos of its small value in postoperative thyrotrophic proptosis, that its effect was beneficial. In the primary type of thyrotrophic exophthalmos, unless of very longstanding, improvement follows iodine administration, the response being slow but good and maintained during the employment of the drug. One patient treated in this way for two years showed a progressive fall in the B.M.R. from +36 to +14 percent, with moderate improvement in the exophthalmos. It would appear that the value of iodine in this disease is much the same as in acromegaly, in which the hyperthyroidism is thyrotrophic in source. Friedgood (1936) describes a case of acromegaly on iodine in which the B.M.R. fell from +43 to +32 percent after six months and again to +27 percent after a further six months. In another patient, the B.M.R. was reduced some 10 points by similar methods but rose again to about 30 points after its administration was stopped.

Estrin and related compounds may have an effect similar to that of iodine, owing to the depression of gonadotrophic and thyrotrophic output which follows its administration. Its employment is probably safe, as Marine has shown that its dispensing to castrated animals treated by injections of pituitary extract did not develop exophthalmos. Results, however, have proved uncertain in spite of large dosage. Possibly it is of most value in postmenopausal cases in conjunction with thyroid extract as an alternative to iodine. Stilbestrol, on account of its inexpensiveness, is a suitable agent and may be given in doses of 5 to 10 mg. daily.

More potent than either of the former remedies is the influence of thyroid extract. Although it may appear paradoxical to administer thyroxine to patients already subject to hyperthyroidism, nevertheless its exhibition may lead to improvement, particularly in regard to the exophthalmos, which, having no relation to the associated hyperthyroidism, is unlikely to be affected by a temporary increase of the basal metabolism. In one such case, a man aged 56 years with a six months' history, presented a second-stage proptosis, having complete immobility of the left eye and considerable restriction of movement in the other, chemosis, bloodstained lacrimation, and edema of both lids. The B.M.R. was about +20 percent. On two grains of thyroid daily, the improvement was so rapid and dramatic that the patient was back at work as a garage hand within six weeks of being bedridden. When seen a short time ago, there was no clinical evidence of hyperthyroidism, and the patient's eyes had reverted almost to normal, full movement being restored and only a slight degree of exophthalmos remaining as shown by means of the scleral test. The thyroid administration has since been stopped and there has been no relapse. No photographs exist, unfortunately, to record the patient's progress, but the clinical appearance before and after improvement strongly resembled that in Gasteiger's case (fig. 28).

Fig. 28 (Mulvany). Thyrotrophic exophthalmos. Postthyroidectomy progression cured by thyroid administration (Gasteiger, 1931).

The postoperative exacerbation is more resistant to general measures, owing to the abnormal stimulus to the pituitary gland provided by the operation. Iodine is of little avail and requires to be supplemented by large doses of thyroid extract. Owing to the small amount of thyroid secretion present, a daily dose of 5 grains will be well tolerated but the quantity may be increased to 7½ to 10 gr. when a rapid result is required. This dose may raise the B.M.R. to about +30 percent, but it seems that this degree of hyperthyroidism is not badly borne, possibly because it is not accompanied by the sympathetic overaction of thyrotoxicosis. When improvement is manifest, the dose may gradually be reduced but will have to be continued for a variable period of months to years until the disease has subsided or became stationary.

Of *local* measures, none are required in the first stage and are usually too late in the third. It is in the progressive sec-

ond stage that active measures will give most success. Plastic operations are of little avail, owing to the uncompromising retrobulbar pressure; hence lid suture, as Jessop put it in 1896, is "not to be recommended in cases of Graves's disease with chemosis and deep ulceration of the cornea." Local operative measures, such as the partial decompression of the Foster Moore or Krönlein type, seldom prove of value except in the milder kind of disturbance.

The only operation likely to be of real service is the orbital decompression devised by Naffziger or some modification of it. Naffziger carried out the measure through a transfrontal approach, and the extent of the decompression is very important if adequate relief is to follow. The distance to which the frontal sinuses extend into the orbital plates is a factor of consequence, as their extension backward may sometimes be so great that a sufficient removal of bone from the frontal fossa may be impossible. In order to overcome this difficulty, Naffziger advised removal not only of the roof but also of the bones leading into the temporal fossa and close to the orbital rim. Posteriorly to this, the removal of bone was continued into the middle fossa, including the postero-lateral portion of the orbital wall down to the orbital fissure. The presence of papilledema required the unroofing of the optic foramen, a maneuver which greatly enhances the value of the operation.

A lateral approach, as advocated by Swift (quoted by McCravey and Mather) is less formidable, shorter, and allows a speedier convalescence. It has, therefore, much to recommend it although some difficulty may be experienced in securing the radical removal of bone, which is possible by the transfrontal approach.

The results of both operations are excellent, but it is important that the measure be adopted before ulceration or other complications have developed. The operation is followed by immediate recession of the eyes, and improvement continues slowly for some time. Naffziger mentions one patient, operated upon six years previously, who at the time of examination appeared to have normal vision and eye movement. The measure, however, is palliative only, as is shown by the progressive enlargement of the eye muscles after the intraorbital tension has been completely relieved by loss of the globe. Thus, Merrill and Oaks (1933) mention a case in which the "stump progressively protruded . . . and remained until death two years later so prominent that the eyelids could not be closed over it." Thompson and Woods (1936) recall a similar case in which the progressive bulging of the stump between the lids necessitated a plastic operation to remove it.

A final word of caution regarding accurate diagnosis. This is important as the hasty performance of a thyroidectomy in a case of thyrotrophic exophthalmos may precipitate disaster as much as would the performance of an orbital decompression in the thyrotoxic patient.

Examination of certain controversial problems in light of differentiation

1. *Correlation* between the majority of diverse and apparently opposed views—experimental, clinical, and pathologic—is possible on a two-fold basis.

2. *Mechanism of proptosis* is clearly of two types, each being uninterchangeable and peculiar to its own particular state. The part played by the sympathetic nervous system and thyrotoxic myasthenia and atonia in relationship to thyrotoxic exophthalmos and that by retrobulbar pressure to thyrotrophic

proptosis is definite and simple to follow. In classical Graves's disease there is no evidence, either clinically or at autopsy, of a raised retrobulbar tension and the presence of this feature is sufficient to indicate the nonthyrotoxic nature of the disturbance. On the other hand, an increased intraorbital pressure is a constant feature of thyrotrophic exophthalmos.

3. *Lid retraction.* In thyrotoxicosis this is due to spasm of the smooth muscle in the lids and is dependent upon sympathetic overaction. There is no evidence to show that it is connected with contraction of the striated levator. Blocking of the cervical sympathetic impulses by infiltration or removal of the lower ganglion improves or cures the condition. On the other hand, the lid retraction of thyrotrophic exophthalmos is nonspastic, being due to a disturbance of the power which the upper lid normally possesses of being able to accommodate itself to the globe. As a result of enlargement of the extraocular cone, the levator is displaced upward and, being stiffened and swollen and fixed posteriorly, is affected by a relative shortness resulting in the appearance of upper-lid retraction.

4. *Congestion and edema.* These features do not form part of the thyrotoxic syndrome except in response to local ulceration and infection. Edema, however, is a constant feature of thyrotrophic exophthalmos, being manifested first in the curious glistening character of the ocular conjunctiva. Later, wrinkling of this membrane, on rolling the eye, is visible, and chemosis develops, being quickly followed by corneal ulceration and perforation, if left unrelieved.

5. *Lid suture for corneal ulceration.* The corneal ulceration of thyrotoxicosis is usually of a superficial grade and is able to respond to lid suture even when edema due to local sepsis complicates the picture, provided local tension is relieved by adequate tarsorrhaphy. In certain instances healing will occur spontaneously, even in the absence of treatment to the gland, but delay in carrying out a thyroidectomy should be avoided. On the other hand, in thyrotrophic exophthalmos lid suture is not advisable nor without danger, as it aggravates the tension of the lids across the corneal surface. The remedy lies in the checking of the irresistible retrobulbar force and consists of an orbital decompression. At the same time, it should not be overlooked that the performance of this operation for thyrotoxic exophthalmos, apart from being useless, is liable to be followed by disaster.

6. *Disturbance of eye movement and eye palsies.* In exophthalmic goiter, this feature is the result of the unequal development of thyrotoxic weakness in one or more of the eye muscles. In the early stages, it may show properties common to other myasthenic processes, such as improvement after rest or a response to prostigmine administration. Most frequently the internal or external recti muscles or the levator is affected, but the disturbance is very irregular and usually differs on the two sides. In thyrotrophic exophthalmos, eye movement is affected early in the course of the disease, usually in an upward direction, being due mainly to mechanical hindrance occasioned by the swelling and stiffening of the conjoined levator and superior-rectus muscles. Later, as intraorbital pressure rises, eye movement becomes limited in all directions and may be lost. Myasthenia, however, plays no part in this latter development, and the response to prostigmine is absent.

7. *Dislocation of the globe.* This has occurred in thyrotoxicosis, owing to the width of the palpebral fissure and the laxity of the extraocular muscles. Occasionally, movements, such as coughing and sneezing, may be sufficient to produce

it. On the other hand, dislocation is practically impossible in thyrotrophic exophthalmos, as the lids are unable to retract over the enlarged voluntary muscles.

8. *The basal metabolism.* In thyrotoxicosis this is consistently raised while the proptosis is developing. In the thyrotrophic condition, hyperthyroidism bears no relation to the proptosis, and particularly severe instances have appeared after a thyroidectomy has been carried out when the basal metabolism is low.

9. *The effect of thyroidectomy.* This is beneficial in thyrotoxicosis, as the operation removes the cause of the trouble. The proptosis is improved or not altered. Thyroidectomy for thyrotrophic exophthalmos may produce unfortunate results, as the operation, while curing the hyperthyroidism, stimulates the pituitary body to greater secretory effort and results in greater thyrotrophic formation. Progression of the proptosis after thyroidectomy in thyrotoxicosis can be due only to insufficient removal or recurrence. In the pituitary variety, postoperative progression is not uncommon and may be regarded as a clinical feature.

10. *Effect of thyroid and iodine administration.* In thyrotoxicosis, iodine will be beneficial and thyroid harmful. In thyrotrophic exophthalmos, iodine and thyroid may both be of benefit, the former being most valuable prior to thyroidectomy and the latter of greatest use afterward; although, paradoxical as it may seem, the administration of thyroid in thyrotrophic hyperthyroidism may serve to lower the basal metabolism rather than raise it. Both of these substances act by reducing the thyrotrophic activity of the hypophysis.

(*Part III will appear in the next issue.*)

THE ETIOLOGY AND TREATMENT OF TOBACCO-ALCOHOL AMBLYOPIA*

Part I

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Until very recently it was generally assumed among ophthalmologists that in certain susceptible individuals tobacco and alcohol had a direct toxic action on the optic fibers in the papillomacular bundle or on those retinal ganglion cells which sent their nerve fibers into the papillomacular bundle. The reasons for believing this were somewhat as follows: (1) There was a very definite clinical entity characterized by bilateral centrocecal scotomas which developed gradually; this entity was seen in individuals who drank or smoked, or, more commonly, who both drank and smoked. (2) Clinical experience had indicated that if patients with this condition stopped smoking and drinking before optic atrophy developed, the scotomas usually decreased markedly in size and density and the vision improved considerably. (3) If patients with this condition did not discontinue the use of tobacco and alcohol, or markedly reduce their intake, they did not improve. In a study made in 1935 the writer[1] found only a few exceptions to the last rule and, until his subsequent findings on the importance of diet in the treatment of this condition,[2] it appeared to be the consensus of medical opinion that patients with tobacco-alcohol amblyopia did not get well unless they discontinued, or at least markedly reduced, the use of these substances.[3]

It was impossible, however, to explain on this basis all the factors involved. Some of the more puzzling of these were as follows: Tobacco-alcohol amblyopia often occurred in an individual who had smoked and drunk the same amount over a period of many years without developing the condition. Why did poor vision develop without any increase in the intake of tobacco or alcohol if these substances actually were the cause? Did the "susceptible" individuals really have an "idiosyncracy"? Certainly there are tens, perhaps hundreds, of thousands of heavy smokers and drinkers who never develop this condition despite their large intake of tobacco and alcohol. On the other hand, numerous patients who develop the amblyopia use these substances in moderate quantities only. Usher[4] found that among people over 50 years of age those with tobacco amblyopia actually used less tobacco than controls who had no amblyopia. This finding, based on a series of 1,100 cases of tobacco amblyopia and 500 control cases, would seem to have considerable significance. From it one would conclude that individuals contracting this disease must be more susceptible to the supposedly harmful effects of tobacco and alcohol. It was noteworthy, however, that these patients showed no other evidence of increased susceptibility or idiosyncrasy to these substances. Skin tests with tobacco, and peripheral vascular studies after smoking, showed no abnormalities.[1] Most of the heavy drinkers with this condition can tolerate a much larger amount of alcohol than can the average person without having their nerv-

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ous systems show signs of intoxication; that is, they have built up a tolerance for alcohol and, in that sense at least, have decreased rather than increased susceptibility to it.

Many thoughtful investigators in the past have called attention to factors which seemed to precipitate the onset of tobacco-alcohol amblyopia and have mentioned

bacco-alcohol amblyopia have been seen by the writer during the nine-year period 1933-1942. In 1935 the present investigation was undertaken and a preliminary report was published in 1937.[2] At that time eight patients with tobacco-alcohol amblyopia had been hospitalized, allowed to consume their usual intake of tobacco and alcohol, and had been given a well-

TABLE 1

TOBACCO-ALCOHOL AMBLYOPIA. SUMMARY OF RESULTS IN 25 PATIENTS WHO CONTINUED THE USE OF TOBACCO AND ALCOHOL WHILE RECEIVING SPECIAL DIETS

Case No.	Patient	Vision Before Treatment	Vision After Treatment	Time Followed months
1	C.S.	20/200 20/200	20/50 20/50	25
2	G.J.	20/200 20/200	20/30 20/20	5
3	N.M.	10/200	20/40 *	3
4	W.F.	20/200 20/200	20/30 20/30	73
5	E.F.	FC 3′ FC 3′	20/20 20/20	22
6	H.R.	 5/200	* 20/70	85
7	F.S.	20/50 20/70	20/20 20/20	76
8	W.H.	15/200 10/200	20/15 20/15	80
9	L.W.	20/50 20/50	20/20+ 20/20+	58
10	A.F.	20/200 20/200	20/30 20/30	55
11	H.W.	20/200 20/70	20/20 20/20	31
12	D.F.	20/200 10/200	20/15 20/15	41
13	J.H.	 20/200	* 20/20−	21
14	R.L.	5/200 6/200	20/20− 20/20−	10
15	W.S.	20/100 20/200	20/20 20/20−	25
16	E.S.	4/200 4/200	20/70 20/70	5
17	A.M.	20/40 20/40−	20/20− 20/20	6
18	A.N.	FC 2′ FC 4′	20/30 20/30	72
19	A.B.	5/200 20/100	20/30− 20/30	20
20	L.P.	20/100 20/100	20/30 20/30	24
21	C.S.	20/200 20/70	20/20− 20/20−	8
22	H.F.	20/40 20/70	20/15 20/20	7
23	R.L.	20/70− 20/200	20/20 20/20	56
24	W.R.	20/200 20/50	20/30− 20/20−	4
25	D.W.	20/50 20/40	20/20− 20/20−	4

* In this case only one eye was considered for the purpose of this study, the other having pathology which was in no way related to the amblyopia.

that the general nutrition of the patient appeared to affect the development of the disease;[5] for example, de Schweinitz[3] in 1896 wrote, "Other circumstances (besides alcohol) which favor a deleterious effect of tobacco on vision are malnutrition from any source, chronic gastritis, dyspepsia, mental worry, and particularly insomnia."

Approximately 175 patients with to-

balanced diet supplemented with large quantities of brewers' yeast. These patients (cases 1-8, Appendix) made very satisfactory recoveries despite their continued use of tobacco and alcohol. Since that time 17 additional patients have been allowed to continue, or have refused to discontinue, their use of these substances and have been treated in various ways in an effort to determine what factor in the

diet or in the yeast cured the amblyopia. These 17 cases, together with 8 previously reported, constitute a series of 25 consecutive patients with this condition who were able and desired to coöperate in this study and who did not have optic atrophy when first examined. The only exception to the latter specification was the first patient treated (case 1, Appendix) who had partial optic atrophy and showed only slight improvement on treatment.

Table 1 summarizes the results obtained with the entire series; these are at least as good as results obtained by the author in any previous consecutive 25 patients with tobacco-alcohol amblyopia, including those who abstained from the use of tobacco and alcohol while under treatment. The vision in 21 of the 25 patients was 20/30 O.U. or better after treatment; in 14 it was 20/20 or better. Of the four patients whose vision failed to improve to 20/30 while under observation, one (case 1) had partial optic atrophy before treatment, one (case 6) had lens opacities and entirely disregarded his diet after his vision had improved to 20/40, and two (cases 3 and 16) were followed only three and five months, respectively.

Eleven of the 25 patients (cases 1 to 9, 18, 23, Appendix) were given a high vitamin-B, well-balanced diet, adequate in all respects and supplemented by powdered brewers' yeast. A second group of five patients was allowed to continue on the same diet taken while developing the amblyopia and was given either yeast or vitamin-B complex in the form of tablets or in an elixir. The results of this treatment appear in table 2. Every patient in the group obtained vision of 20/30 O.U. or better. Two of them were not hospitalized, one being seen in private practice and the other in the clinic. They merely continued to eat, drink, and smoke as usual but in addition took the prescribed vitamin-B–complex products.

TABLE 2

PATIENTS LEFT ON USUAL DIET WITH VITAMIN-B COMPLEX ADDED

Case No.	Name	Vision Before Treatment	Vision After Treatment	Amount of Tobacco and Alcohol Used Daily	Amount of Synthetic Vitamin B_1 Taken Daily in Addition to that in the Vitamin-B–Complex Products	Amount of Vitamin-B Complex Taken Daily	Period of Observation months
17	A.M.	10/200 20/100	20/20− 20/20	1 pint liquor 2 pkg. cigarettes	20 mg.	35 c.c. Betaplexin	6
20	L.P.	20/100 20/100	20/30 20/30	2 quarts beer ½ pkg. cigar clippings	none	yeast 25 gm.	24
21	C.S.	20/200 20/70	20/20− 20/20−	2 glasses wine 8 cigars ½ pkg. tobacco	none	24 c.c. Betaplexin	8
22	H.F.	20/40 20/70	20/15 20/20	2 cigars 6 cigarettes	none	yeast 35 mg.	3
24	W.R.	20/200 20/50	20/30− 20/20−	1 quart liquor 6–10 cigars	5 mg.	yeast 65 gm. Vegex 12 c.c.	4

The patients comprising the next two groups, however, were hospitalized and observed closely throughout the period of treatment. This was necessary because they were placed on a diet that was calculated to be inadequate in all vitamins. The caloric intake was sufficient to prevent loss of weight, but such a diet of necessity provides only uninteresting monotonous meals and most of the patients did lose weight. None developed any clinical evidence of other deficiency dis-

TABLE 3

PATIENTS PLACED ON INADEQUATE DIETS PLUS THIAMIN CHLORIDE AND REST OF B COMPLEX

Case No.	Name	Vision Before Hosp.	Vision After Hosp.	Amount of Alcohol and Tobacco Used Daily	Amount of Synthetic Vitamin B_1 Taken	Amount of B Complex Taken	Time in Hosp.	Final Vision
13	J.H.	20/200	20/40	1 pint liquor 8 cigars	20 mg.	12 capsules (Lederle B complex)	26 days	20/20 O.S.
16	E.S.	4/200 4/200	20/200 20/200	12 oz. liquor 1 pkg. cigarettes	15 mg.	6 capsules B complex—200 mg. nicotinic acid	18 days	20/70 O.U.
17	A.M.	10/200 20/100	20/50 20/40–	1 pint of liquor 2 pkg. cigarettes	20 mg.	36 c.c. of Betaplexin	4 weeks	20/20–O.U.
19	A.B.	5/200 20/100	20/80 20/30	1 pint of liquor 1 pkg. cigarettes	40 mg.	9 capusles B complex	4 weeks	20/30– 20/30

ease, however, probably because the regime was always terminated before such conditions could occur. The reason for placing these patients on a diet inadequate in all known vitamins was, of course, to exclude the possibility that some or all the improvement might be due to something besides the vitamin-B fraction. A group of four patients on this inadequate diet was given a vitamin-B–complex product which is available commercially,* plus synthetic vitamin B_1. The results, as shown in table 3, seemed to be as good as those in the preceding ones.

As a final step patients in another group placed on this inadequate diet, who were of course also consuming their usual amounts of alcohol and tobacco, were given synthetic vitamin B_1 only. Any improvement in their condition could be assumed to be due to the added vitamin B_1. As may be seen in table 4, the results were good and would seem to be significant.

* Winthrop Chemical Company, 170 Varick Street, New York City, kindly provided the vitamin B_1 (Betaxin) and elixir vitamin-B complex (Betaplexin) used in this study.

TABLE 4

PATIENTS PLACED ON INADEQUATE DIETS SUPPLEMENTED ONLY WITH SYNTHETIC VITAMIN B_1

Case No.	Name	Vision Before Hosp.	Vision After Hosp.	Amount of Alcohol and Tobacco Used Daily	Amount of Vitamin B_1 Taken Daily	Time in Hospital	Final Vision
10	A.F.	20/200 20/200	20/40 20/200	1 pint of liquor 1 pkg. cigarettes 1–2 cigars	43 mg.	6 weeks	20/30 O.U.
11	H.W.	20/200 20/70	20/30– 20/20	1 pt. liquor 30 cigarettes	15 mg.	5 weeks	20/20 O.U.
14	R.L.	5/200 6/200	20/200 20/200	1 pt. liquor ½ pkg. tobacco	40 mg.	4 weeks	20/20 O.U.
15	W.S.	20/100 20/200	20/20– 20/50–	1 pt. liquor 1 pkg. cigarettes	40 mg.	3 weeks	20/20 20/20–
25	D.W.	20/50 20/40	20/30 20/30	1 pt. liquor 1 pkg. cigarettes	20 mg.	3 weeks	20/20 O.U.

In the last group of cases (10, 11, 14, 15, 25, Appendix), some complications occurred. The patient in case 11 stated that he developed a dryness of the hands and pains in the arms and calves of the legs which lasted four or five days. The patient in Case 14 improved on vitamin B_1 until his vision was 20/70 O.U.; when nicotinic acid was added there was further improvement; finally, when the whole B complex was taken, the vision became 20/20 O.U. It is possible, of course, that the improvement might have progressed in the same way even if the other factors of the B complex had not been added. The vision in case 15 improved from O.D. 20/100, O.S. 20/200 to O.D. 20/20, O.S. 20/50 during three weeks' hospitalization on 40 mg. daily of vitamin B_1 and an inadequate diet, but after the patient had been home a month, during which time he continued to take the thiamin, he returned with a vision of 20/50, 20/200 and a markedly contracted field, O.U. This is the only case of tobacco-alcohol amblyopia the writer ever has seen in which such a contraction of the visual field developed. The patient was an emotional individual, but it was not possible to prove that the contraction was on a functional rather than an organic basis. The significance, if any, of this isolated finding cannot be evaluated at this time. The peripheral field returned to normal after nicotinic acid was administered, and eventually, when brewers' yeast had been substituted for the more refined preparations, vision became 20/20, O.U., without any scotomas.

In 1939 Johnson[6] reported five cases of tobacco-alcohol amblyopia in which the patients were treated with thiamin chloride. Two of them did not discontinue either alcohol or tobacco; one obtained a vision of 20/40, O.U., and the other 20/20, O.U. It is possible that other substances which are necessary for the proper nutrition of the cells may also be of importance. Accurate chemical tests for the various factors of vitamin B which could be applied clinically have not been available during this study but may very well be so in the near future. Meanwhile it may be stated that a pure vitamin-B_1 deficiency is probably not common. Deficiencies tend to be multiple. It would seem, therefore, that in spite of the good results obtained with thiamin chloride in these cases, it would be much sounder therapeutically to administer the whole B complex rather than just thiamin. For scientific purposes it was of interest to establish the fact that definite partial or complete recovery (for example, in case 25) could take place as a result of the addition of thiamin chloride alone, but practically it appeared to be much better to give the whole B complex. It may be still more advisable to give the whole B complex plus additional B_1. In addition it seems desirable to adjust the diet so that the individual is consuming more than the minimum required amounts of all essential substances.

In an effort to determine the adequacy of the diets on which these people were living while developing this "toxic" amblyopia, a careful dietary history was taken from 23 patients by the present dietitian at the Institute of Ophthalmology, Miss Jane Wark, or by one of her predecessors. While it is apparent that these histories are not absolutely accurate, and in a few instances may be considerably in error, they do tend to indicate that the diets in general were low or just border line with respect to vitamin B_1. In 1934, Cowgill[7] calculated the vitamin-B requirement of man, and subsequent clinical studies have supported his calculations. He used the unit "milligram equivalent" in his work, which was published before vitamin B_1 had been synthesized. If the amount of vitamin B

ingested (expressed in milligram equivalent units) is divided by the number of calories consumed, a ratio is obtained. Cowgill showed that for a person of a given weight it is necessary to have a certain vitamin-B calorie ratio. Otherwise symptoms of deficiency eventually develop. It has been estimated that 1,600 calories per day may be utilized from the consumption of alcohol. This, however, contains no vitamin B. In alcoholics, therefore, the calorie intake increases according to the amount of liquor taken and the vitamin-B calorie ratio decreases. Table 5 indicates that all but three of the patients in this series had a diet adequate in vitamin B_1 if alcohol were not considered, but that when the calories obtained from alcohol were taken into consideration, 15 had an inadequate intake of the vitamin and most of the others were just over the line of calculated adequacy.

The last two patients listed in table 5 (cases 12 and 9) had tobacco amblyopia. They were teetotalers and their vitamin-B intake seemed adequate according to Cowgill's calculation. However, when they were given large doses of brewers' yeast they both attained 20/20 vision or better, O.U. One of them (case 12) discontinued tobacco temporarily but resumed it after partial improvement and made a complete recovery. During the 3½ years since his hospitalization he has continued to use large amounts of tobacco and to maintain a good diet. Vision is 20/15, O.U. Two other patients (cases 14 and 22) with tobacco amblyopia were total abstainers from alcohol; both were on inadequate diets. Although polyneuritis and pellagra have occasionally occurred in association with amblyopia,[8] I never have seen a case of tobacco amblyopia with clinical evidence of vitamin deficiency. It is possible that because of

TABLE 5

CALCULATIONS MADE FROM THE DIETARY HISTORIES OF 23 PATIENTS WITH TOBACCO-ALCOHOL AMBLYOPIA

Case No.	Name	Calories from Food	Calories from Liquor	Total Calories	Vit.-B mg. Equiv.	Weight of Pt. kilograms	Vit.-B Calorie Ratio without Alcohol	Vit.-B Calorie Ratio with Alcohol	Minimum Vit.-B Calorie	Adequacy of Vit.-B Intake
6	H.R.	1,207	750	1,957	4,180	77	3.46	2.13	2.20	−0.07
4	W.F.	1,668	1,250	2,918	7,327	74	4.39	2.51	2.10	+0.40
17	A.M.	700	1,600	2,300	3,130	60	4.47	1.36	1.70	−0.24
	A.M.	897	1,600	2,497	3,502	64	3.90	1.42	1.75	−0.33
2	G.J.	1,333	1,600	2,933	3,840	86	2.88	1.30	2.40	−1.10
25	D.W.	1,293	1,250	2,543	2,506	45	1.93	0.98	1.30	−0.32
18	A.N.	2,466	1,450	3,916	5,988	63	2.42	1.52	1.80	−0.28
	A.Y.	1,152	1,200	2,352	3,994	60	3.46	1.69	1.70	−0.01
13	J.H.	1,052	1,252	2,304	1,506	75	1.43	0.65	2.10	−1.45
15	W.S.	804	1,600	2,404	1,377	66	1.71	0.57	1.85	−1.28
20	L.P.	688	960	1,648	3,400	72	4.93	2.06	2.05	+0.01
14	R.L.	1,040	1,600	2,640	2,130	67	2.04	0.80	1.90	−1.10
16	E.S.	922	1,600	2,522	2,174	71	2.35	0.86	2.00	−1.14
8	W.H.	1,186	1,600	2,786	6,703	63	5.65	2.40	1.80	+0.60
10	A.F.	677	1,250	1,927	3,580	59	5.28	1.81	1.65	+0.16
11	H.W.	1,168	1,450	2,618	2,470	73	2.11	0.94	2.05	−1.11
	A.L.	1,786	525	2,311	5,768	78	3.22	2.09	2.20	+0.29
6	H.R.	1,408	1,600	3,008	3,711	62	2.63	1.23	1.75	−0.52
	F.M.	890	900	1,790	3,143	62	3.53	1.70	1.75	−0.05
7	F.S.	1,348	750	2,098	3,950	51	2.93	1.88	1.45	+0.43
	C.W.	1,369	1,600	2,969	5,117	87	3.73	1.72	2.45	−0.73
12	D.F.	2,054	—	2,054	7,940	66	3.88	—	1.88	+2.00
9	L.W.	1,409	—	1,409	4,185	73	2.97	—	2.10	+0.87

the generalized disturbance in metabolism a greater amount of vitamin B is required than would ordinarily be necessary.

The most likely explanation of tobacco amblyopia at this time is that it is a "toxic" action of the tobacco on malnourished cells. When vitamin B_1 is added, the nutrition of the damaged cells, or perhaps their axons, improves, and the injurious agent is no longer injurious. It seems likely from present evidence that people consuming, absorbing, and utilizing normal amounts of vitamin B never develop tobacco amblyopia.

Alcohol amblyopia may be merely a manifestation of a deficiency condition without any "toxic" element. One factor opposing this interpretation is that most of the affected patients do not show other clinical evidence of deficiency disease. Another is that in this country, in the author's experience, only patients who drink or smoke develop this syndrome. We would expect some patients who failed to consume, absorb, or utilize vitamin B normally to develop the condition even though they did not drink. A possible answer to the first objection is that a deficiency condition often manifests itself in different ways in different individuals; some alcoholic patients get peripheral neuritis, some get cerebral disturbances, some get "alcohol" amblyopia, some get all of these things at once. A possible answer to the second objection is that in this country, especially in the North, the great majority of patients with gross vitamin-B deficiencies are alcoholics. In the Orient, on the other hand, where vitamin-B deficiencies are usually not associated with alcoholism, the same type of amblyopia develops. It is called beriberi amblyopia and, according to the description of it by Elliott[9] and Ishihara,[10] is identical with "alcohol" amblyopia.

"Diabetic amblyopia" is a condition about which there has been some question. The only patients with diabetes that the writer has seen develop the typical syndrome of tobacco-alcohol amblyopia did smoke or drink, at least in small amounts. However, Friedenwald[11] had one patient who had what might be called "diabetic amblyopia." She was a middle-aged diabetic woman who had never used tobacco nor alcohol, but she had the typical bilateral scotomas found in tobacco-alcohol amblyopia. Her condition did not improve until vitamin-B complex was administered. The recovery was then rapid and complete. This case, of course, fits in very well with the idea that the primary difficulty in such patients, whether they have diabetes, beriberi, or alcoholism, is a deficiency of an essential vitamin.

Summary and Conclusions

Approximately 175 patients with tobacco-alcohol amblyopia have been observed by the writer in the nine-year period 1933-1942. In the last seven years 25 of these patients have been allowed to maintain their usual intake of alcohol and tobacco under the following conditions:

(1) An initial group of 11 patients was placed on a diet adequate in all respects and supplemented with brewers' yeast.

(2) A second group of five patients was left on its usual diet and given vitamin-B complex.

(3) A third group of four hospitalized patients was placed on a diet inadequate in all known vitamins and given large amounts of vitamin-B complex.

(4) A fourth group of five hospitalized patients was placed on the same inadequate diet and given synthetic vitamin B_1 only.

All of the patients on these various regimes made partial or complete recoveries in spite of their continued and unabated use of tobacco and/or alcohol. The vision in 21 patients was 20/30 O.U. or better after treatment and in 14 was

20/20 or better. These results were at least as good as those obtained by the author in any previous consecutive 25 patients with this condition, including those who abstained from the use of tobacco and alcohol while under treatment.

The fact that all of the patients in the fourth group improved and one made a complete recovery is of special significance since in this group every known factor other than vitamin B_1 which might have caused improvement had been eliminated. In spite of this result, however, it is recommended that the whole vitamin-B complex be administered as well as thiamin alone in the treatment of these cases.

Appendix

This includes 25 case reports of patients with tobacco-alcohol amblyopia who continued their consumption of tobacco and alcohol. The onset of the amblyopia occurred within the past year in a few instances but it is significant that 16 of the 25 patients have been followed for an average of four years each and five have been observed over a period of six years or longer. The first 8 cases were previously reported in 1937.[2]

Case 1. C. S., a 28-year-old Negro woman, was first examined in the Vanderbilt Clinic in October, 1934. She had marked tremor of the tongue and fingers, and her breath had a strong alcoholic odor. The vision was 20/200 in each eye and was unimproved with glasses. The discs showed very marked temporal pallor consistent with atrophy of the papillomacular bundle, and the fields revealed depression of central vision. She had never used tobacco in any form but consumed between a pint and a quart of whisky daily. In three months vision improved to 20/70 in each eye and remained stationary. She was strongly advised to discontinue the use of alcohol, but she refused. Nine months after coming under observation she was admitted to the Institute of Ophthalmology. The discs appeared atrophic temporally. She had alcoholic gastritis, and two gastric analyses showed absence of free hydrochloric acid. During 36 days in the hospital she drank between one pint and one quart of liquor daily. (The liquor given to her and to all other patients and referred to hereafter merely as "liquor" consisted of equal parts of 95 percent ethyl alcohol and water flavored with the juices from lemon and orange peels. It had a pleasant odor and taste.) She took the prescribed diet. After this period she felt that her vision had definitely improved. I was certain that her eyes were not worse. She could read several lines lower on the test chart than on admission, but I felt that her condition should be considered unimproved. She has been followed 22 months since discharge from the hospital, and her eyes have shown no further change. The diagnosis was alcoholic amblyopia and partial optic atrophy, unimproved.

Three months after the above was written the patient returned to the Clinic. The vision was 20/50 O.U.

Case 2. G. J., a 31-year-old-actor, a private patient of Dr. Gordon Bruce, entered the Institute of Ophthalmology on December 3, 1935. He drank about one quart of gin and smoked from one to two packages of cigarettes daily. Vision was 20/200 in each eye. Each disc was orange except temporally, where it was somewhat pale. The margins were indistinct, except temporally, and slightly elevated (less than 1D.). Elevation of the disc is unusual in this condition. The fields showed typical centrocecal scotomas. Neurologic examination, roentgenograms of the head, and the Wassermann test gave negative results. A medical consultant diagnosed alcoholic gastritis and hepatitis. In the hospital the patient took from one pint to one quart of liquor daily, smoked from one to two packages of cigarettes daily and faithfully ate what was given to him. In two weeks vision was 20/120 in the right eye and 20/50 in the left, and the margins of the disc appeared less elevated. In one month vision was 20/40 in the right eye and 20/30 in the left, and the scotomas had greatly decreased in size. The patient was discharged from the hospital on January 24, 1936, and three months later vision was 20/30 in the right eye and 20/20 in the left. He has not abstained from alcohol or tobacco, but he stated in a recent communication that his vision has remained the same.

Case 3. N. M., a 36-year-old janitor, drank about one quart of liquor and smoked one package of cigarettes daily. He was first seen in the Bellevue Psychiatric Hospital on December 12, 1935. He had pellagra, polyneuritis, and alcohol amblyopia. Vision was 10/200 in the right eye and 8/200 in the left. Each disc showed marked temporal pallor compatible with optic atrophy, and the fields had centrocecal scotomas. When his condition permitted he was transferred to the Institute of Ophthalmology. Retinoscopic examination indicated a large astigmatic error in the left eye, and he stated that vision had never been good in that eye.

For the first month in the hospital he was forced to abstain from all alcohol and tobacco, and there was slight improvement. Visual acuity increased from 18/200 in the right eye and 12/200 in the left eye to 20/120 in each eye with correction. He was then given from one pint to one quart of liquor daily and cigarettes. He faithfully took his diet. In one month on this regimen vision increased to 20/50 in the right eye and to 20/120 in the left, and the fields were improved; in another five weeks, when he was discharged, vision was 20/40 in the right eye and 20/80 in the left.

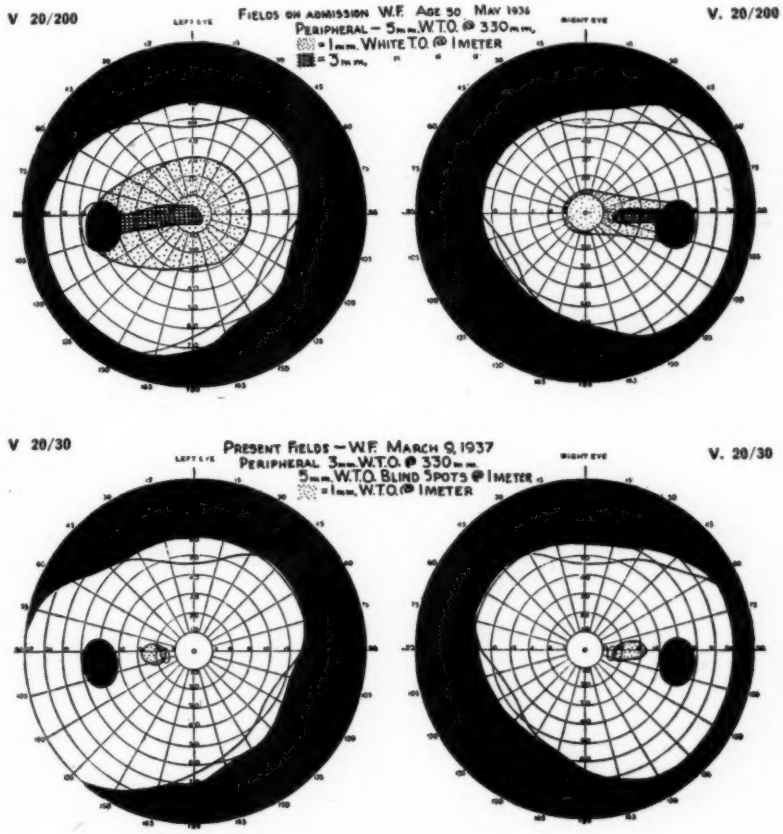
V 20/200
FIELDS ON ADMISSION W.F. AGE 50 MAY 1936
PERIPHERAL – 5mm. W.T.O. @ 330mm.
= 1mm. WHITE T.O. @ IMETER
= 3mm.
V. 20/200
V 20/30
PRESENT FIELDS – W.F. MARCH 9, 1937
PERIPHERAL 3mm. W.T.O. @ 330mm.
5mm. W.T.O. BLIND SPOTS @ IMETER
= 1mm. W.T.O. @ IMETER
V. 20/30

Fig. 1 (Carroll). Case 4. Fields of W. F.

Case 4. W. F., a 49-year-old Jewish waiter, had noticed decreased vision for four months. He had been to two ophthalmic clinics and when first seen by me was at the Neurological Institute, where he had been sent because of a suspected tumor of the brain. He smoked from 10 to 13 cigars daily and drank an average of two or three glasses of beer and an ounce (30 c.c.) of whisky daily. Vision was 20/200 in each eye; the discs were normal in appearance, and the fields showed characteristic centrocecal scotomas (fig. 1). He was transferred to the Institute of Ophthalmology on May 13, 1936, and placed on the prescribed diet. He continued to smoke from 9 to 15 cigars daily and was given 6 ounces (177 c.c.) of liquor daily. Neurologic examination showed some increase in the deep reflexes on the left. An otologic check-up revealed early toxic neuritis of both eighth nerves, and the audiograms were similar to those previously reported. The diameter of the right pupil was 1 mm. larger than that of the left; there were small opacities in both the cornea and the lens of each eye. In two months vision was 20/50– in the right eye and 20/60 in the left. In the next two months visual acuity did not improve, but the patient reduced his consumption of alcohol and tobacco somewhat. In three and a half months vision was 20/30 in each eye and the fields were as shown in figure 1.

The patient was last examined on June 25, 1942, six years after entering the Eye Insti-

tute. The vision was O.U. 20/30, and the field was similar to that shown above after treatment.

Case 5. E. F., a 32-year-old Negro postoffice clerk, had the alcoholic type of pellagra, polyneuritis, and amblyopia. When he entered the Institute of Ophthalmology on May 14, 1935, vision was 3/200 in each eye (fig. 2). He abstained from alcohol and took all the prescribed food for 35 days. Vision by then had improved to 20/40+ in each eye, and he was discharged. He immediately started to drink and smoke as much as previously but regularly took the powdered brewers' yeast and wheat germ as prescribed. Vision gradually improved to 20/20 in each eye, and the fields showed only a small indefinite scotoma between the blindspot and the fixation point. Then he stopped taking yeast but continued his usual intake of whisky (from one pint to one quart daily). In about five weeks the pellagra returned, and he came back to the clinic. He had mild typical pellagral dermatitis, pain in his legs and feet, and diarrhea. His vision was still excellent. He was given more yeast. Then he disappeared until December 17, 1936, when he came back so weak that he could walk only with difficulty. He had the dermatitis, stomatitis, diarrhea, and peripheral neuritis which accompany pellagra. He had continued his intake of alcohol, but instead of taking 4 tablespoonfuls of powdered brewers' yeast daily he had been using only a few tablets of powdered brewers' yeast daily.

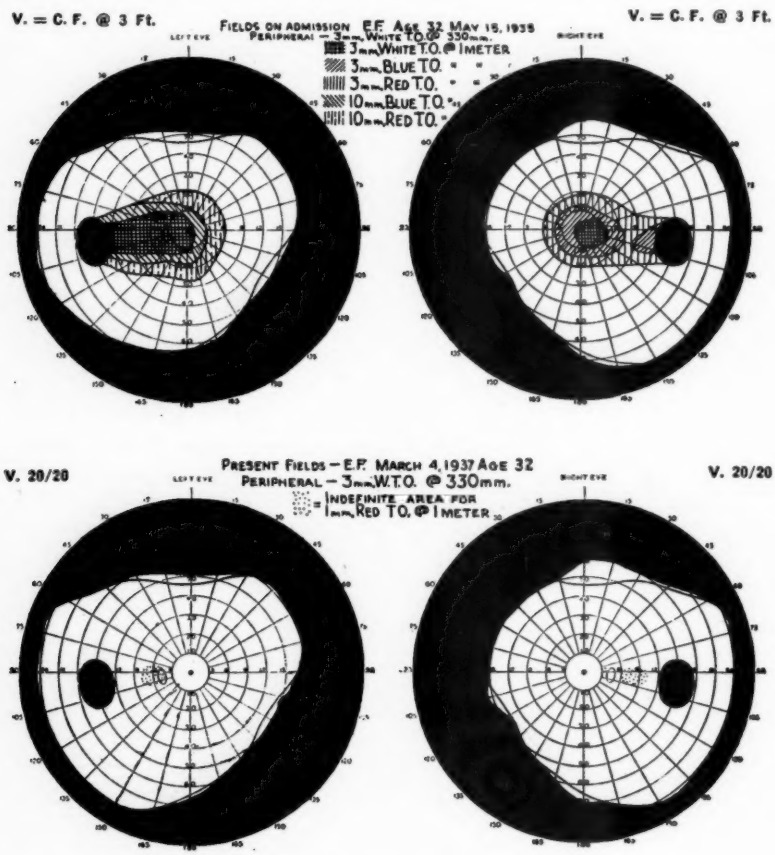
V. = C. F. @ 3 Ft.
FIELDS ON ADMISSION E.F. AGE 32 MAY 15, 1935
PERIPHERAL — 3mm. WHITE T.O. @ 330mm.
3mm. WHITE T.O. @ 1 METER
3mm. BLUE T.O.
3mm. RED T.O.
10mm. BLUE T.O.
10mm. RED T.O.
V. = C. F. @ 3 Ft.
V. 20/20
PRESENT FIELDS — E.F. MARCH 4, 1937 AGE 32
PERIPHERAL — 3mm. W.T.O. @ 330mm.
= INDEFINITE AREA FOR 1mm. RED T.O. @ 1 METER
V. 20/20

Fig. 2 (Carroll). Case 5. Fields of E. F.

Vision remained 20/20 in each eye, and there was only the same small residual scotoma between the blindspot and the fixation area in each eye (fig. 2). He was again hospitalized and given powdered brewers' yeast in doses of 2 tablespoonfuls five times daily (90 gm.), wheat germ in doses of 4 tablespoonfuls three times daily, vegex in doses of 1 teaspoonful three times daily, and 5 or 10 c.c. of liver extract intramuscularly daily. He was also given one pint of liquor daily. Gastric analysis showed lack of free hydrochloric acid. His condition again rapidly improved, and he was

discharged in four weeks free from any symptoms. Since then he had continued his usual consumption of tobacco and alcohol but has faithfully taken 2 tablespoonfuls of yeast daily. He has no symptoms.

Case 6. H. R., a 63-year-old man, was first seen in the Vanderbilt Clinic on May 29, 1935. His vision at that time was 20/200 in each eye with correction. The right eye had not had good vision since having a corneal ulcer 12 years

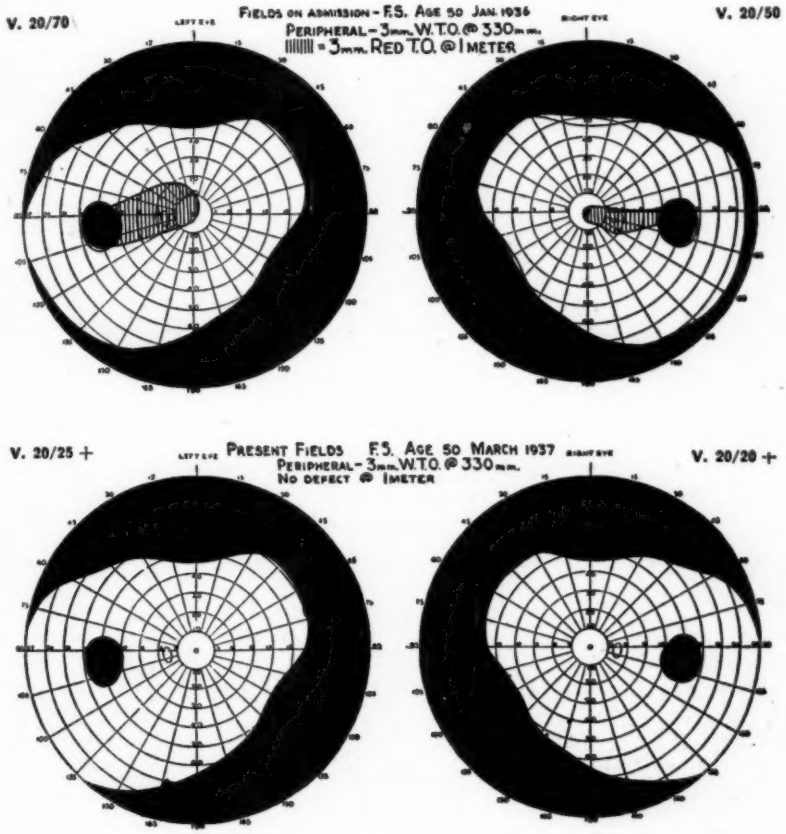
V. 20/70
FIELDS ON ADMISSION - F.S. AGE 50 JAN. 1936
PERIPHERAL - 3mm. W.T.O. @ 330m.m.
3mm. RED T.O. @ 1 METER
V. 20/50
V. 20/25 +
PRESENT FIELDS F.S. AGE 50 MARCH 1937
PERIPHERAL - 3mm. W.T.O. @ 330m.m.
NO DEFECT @ 1METER
V. 20/20 +

Fig. 3 (Carroll). Case 7. Fields of F. S.

previously. It showed diffuse corneal opacities and an incipient cataract. The left eye also had an incipient cataract, which was not sufficiently dense to explain the decreased vision. The discs appeared normal, and the fields showed typical centrocecal scotomas. The patient drank four glasses of beer and smoked from 10 to 12 cigars daily. He was advised to discontinue tobacco and alcohol and did so, but when I first saw him two months later, on July 26th, vision had decreased to 10/200 in the right eye and to 5/200 in the left. He was admitted to the Institute of Ophthalmology and allowed to drink and smoke as much as he wished—this was about 10 cigars daily and from 6 to 14 ounces (177 to 414 c.c.) of liquor. He took all the prescribed diet. No improvement was seen for almost a month; then it came gradually. In two months vision in the left eye had improved from 5/200 to 20/80. The opacities in the cornea and lens of the right eye appeared sufficient to explain the poor vision of 10/200 in that eye. In three months vision of the left eye was 20/60—, and on discharge from the hospital vision of the right eye was 10/200 and that of the left eye 20/40. There was marked decrease in the density of the scotomas. This patient remained in the hospital under close observation for a total of five months. During this time vision of the left eye, which was the only eye in which vision could be expected to improve, increased from 5/200 to 20/40. Except for one week during this period he smoked an average of 10 cigars daily and drank from 6 to 14 ounces of liquor daily. On discharge from the hospital he was advised to decrease or discontinue the use of tobacco and alcohol. It is not certain that he followed this advice. Fourteen months since dis-

charge vision of the left eye was the same—20/40+.

On March 4, 1938, vision was the same—20/40+; on January 16, 1941, it was still the same. On June 25, 1942, the patient was seen again. He had entirely disregarded his diet in the past six months. He was smoking more than ever: one pound of pipe tobacco a month plus three cigars daily. The centrocecal scotoma one quart of wine and smoking one package of cigarettes daily. For the past several years he had noticed some abdominal discomfort, and during the past year had lost from 10 to 15 pounds (4.5 to 6.8 kg.) in weight. His appetite was poor. On January 20, 1936, he entered the Institute of Ophthalmology. He brought his own wine and cigarettes with him, and throughout his stay in the hospital he used the same

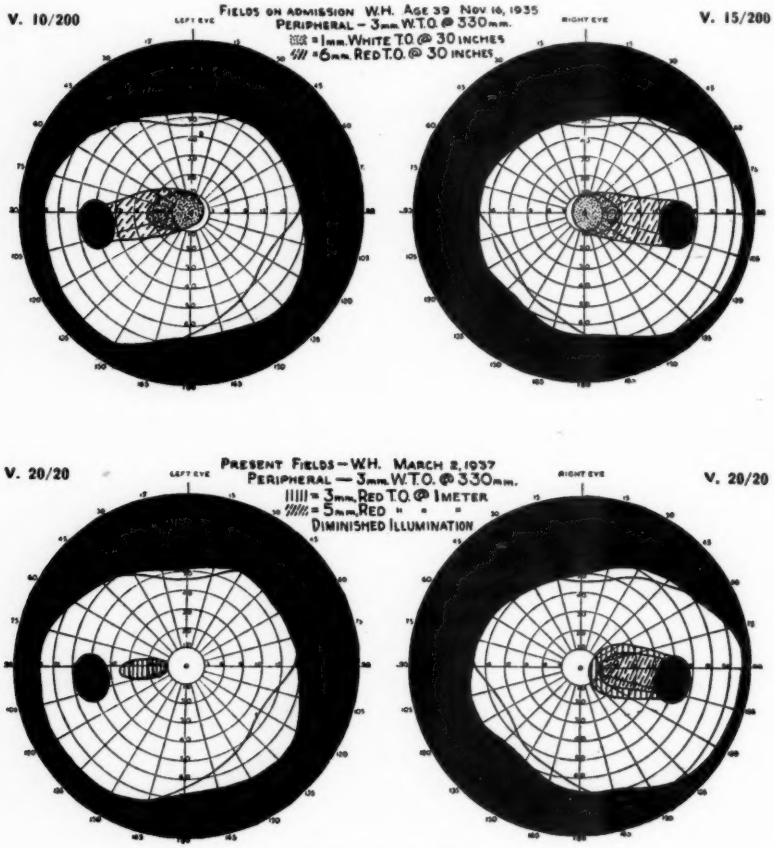
V. 10/200
FIELDS ON ADMISSION W.H. AGE 39 NOV 16, 1935
PERIPHERAL – 3mm. W.T.O. @ 330mm.
= 1mm. WHITE T.O. @ 30 INCHES
= 6mm. RED T.O. @ 30 INCHES
V. 15/200
V. 20/20
PRESENT FIELDS – W.H. MARCH 2, 1937
PERIPHERAL — 3mm. W.T.O. @ 330mm.
= 3mm. RED T.O. @ 1 METER
= 5mm. RED " " "
DIMINISHED ILLUMINATION
V. 20/20

Fig. 4 (Carroll). Case 8. Fields of W. H.

in the left eye had increased in density, and the visual acuity was 20/70. The decrease in vision was due chiefly to the scotoma, although there had been an increase in the lens opacities.

Case 7. F. S., a 50-year-old unemployed Italian bank clerk, was referred to me for treatment by Dr. Charles Perera, who made the diagnosis of toxic amblyopia. Vision corrected was 20/50 in the right eye and 20/70— in the left; typical centrocecal scotomas were present (fig. 3). The discs were normal in appearance. The patient stated that his vision had been gradually decreasing for the past year. He was accustomed to drinking between one pint and amount of wine and smoked the same number of cigarettes that he had consumed while the tobacco-alcohol amblyopia was developing. He remained in the hospital under close observation for seven weeks. He took the prescribed diet. His weight increased 15 pounds (6.8 kg.). His vision gradually improved to 20/20— in the right eye and to 20/30— in the left in 17 days, and was 20/20+ in the right eye and 20/30+ in the left when he left the hospital. Since then 14 months have passed. At no time during this long course of observation has the consumption of alcohol or tobacco ever been reduced. He has continued to take 1 or 2 tablespoonfuls of yeast

daily because I was not sure that it would be safe for him to discontinue it. Vision now is 20/20+ in the right eye and 20/25+ in the left. I am unable to plot any scotoma in either eye (fig. 3).

This patient has been seen every 1 to 2 years. His improvement has been permanent. On June 25, 1942, more than six years after his hospital admission, vision was O.U. 20/20 and no scotoma was present. He had not decreased his smoking or drinking.

Case 8. W. H., a 39-year-old Negro, was seen by me on November 8, 1935, at the Vanderbilt Clinic. He stated that his vision had been gradually decreasing for seven weeks. He drank between one pint and one quart of cheap corn whisky daily and smoked one and a half packages of cigarettes daily. Vision was 20/200 in each eye, and the fields showed centrocecal scotomas, which are always present in the eyes of persons with tobacco-alcohol amblyopia; the rest of the ocular examination gave negative results. One week later, vision had decreased to 15/200 in the right eye and to 10/200 in the left eye (fig. 4), and the patient was admitted to the Institute of Ophthalmology. Gastric analysis revealed absence of free hydrochloric acid. Throughout the period of hospitalization he smoked his usual number of cigarettes daily and was given between one pint and one quart of liquor daily. I purchased a quantity of the corn whisky he had been drinking, had it examined chemically, and then gave it to him for consumption in the hospital. Chemical analysis failed to show any appreciable quantity of any toxic substance except ordinary ethyl alcohol, and this has been the chemical finding in numerous other samples of liquor used by other patients with this type of amblyopia. The diet which he was given was a high vitamin-B, well-balanced diet adequate in all respects and supplemented by powdered brewers' yeast in doses of 2 tablespoonfuls five times daily; vegex (a brewers'-yeast extract) in doses of 1 teaspoonful three times daily, and wheat germ (Embo) in doses of 4 tablespoonfuls three times daily. He was also given liver extract intramuscularly in doses of 5 c.c. several times weekly and cod-liver oil in doses of 1 ounce (30 c.c.) daily. This therapy will be referred to later merely as the "prescribed diet."

While the patient was on this prescribed diet and while he was having his usual intake of tobacco and alcohol his vision gradually improved in seven weeks from 15/200 in the right eye and 10/200 in the left eye to 20/25 and 20/30+, respectively. The fields of vision showed a corresponding improvement, and he was then discharged from the hospital. He was advised to decrease his consumption of alcohol because of any possible effect that such large quantities of alcohol might have on other organs of the body, but he has not followed this advice very well. He was also advised to take 2 tablespoonfuls of powdered brewers' yeast daily, and he has followed this advice somewhat better. Seventeen months have passed since his discharge from the hospital. Vision is 20/20 in each eye.

This patient returned for a check-up in July, 1942—almost seven years after the onset of the amblyopia. Vision was 20/15 in each eye, and the scotoma between the blindspot and the point of fixation was considerably smaller in size and density.

(Part II will appear in the next issue.)

I. METASTATIC CARCINOMA OF THE CHOROID
II. GENERAL METASTASIS FROM A MELANOMA OF THE ABDOMINAL WALL, WITH PARESIS OF THE EXTERNAL-RECTUS MUSCLE
III. RUBEOSIS IRIDIS, WITH MELANOMA OF THE CHOROID AND SECONDARY GLAUCOMA*

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I. METASTATIC CARCINOMA OF THE CHOROID

Metastatic carcinoma of the choroid is an uncommon condition, although Bedell in a paper read before the New York Academy of Medicine in November, 1942, and as yet unpublished, was able to collect 250 cases from the literature. In this paper, which Dr. Bedell kindly permitted me to read, in the third volume of Parsons,[1] and in Duke-Elder's third volume,[2] the literature up to date may be consulted, and from these sources I have drawn for general considerations of this affliction, which my own limited experience does not supply.

The term *metastatic carcinoma of the choroid* is hardly the proper one, since all carcinoma of the choroid is metastatic. There is no epithelium in the choroid from which a primary lesion of such a nature could originate.

Metastatic carcinoma of the eye most often involves the choroid, and in the posterior segment. The reason is that the embolus enters the eye by the short posterior ciliary vessels. That it is not a more common seat of metastasis is owing to the fact that the ophthalmic artery comes off from the internal carotid almost at a right angle, and material in the blood current more readily passes on to the brain and meninges by the more direct route. Anatomic considerations determine the fact that the left eye is more often affected, although, in both of the cases which I am reporting, it was the right eye that suffered. Females are more often affected than males, because the commonest site of the primary growth has been the female breast.

The lesion itself presents a rather characteristic appearance which is described as follows by Duke-Elder:

> It is rarely circumscribed, but rather appears as a flat thickening of the choroid, usually thickest at the posterior pole and thinning off anteriorly. . . . The swelling is of a pale gray color; the surface usually displays a gray mottling, and the edges are not sharply defined. . . . Increase in growth occurs rapidly, more rapidly than in a flat melanoma. Glaucoma is late in appearing, but pain is earlier and more pronounced than in primary tumors, and frequently involves the necessity for enucleation. Retinal detachment may occur.

From various opinions expressed in the literature, the following facts seem to be true:

Carcinoma of the choroid is most common between the ages of 30 and 60 years, as would be expected. It is often bilateral, of rapid growth, rarely perforates the ball, is secondary to a previous growth elsewhere, is often accompanied by low intraocular tension, and is flat, whereas a sarcoma of the choroid is usually round and elevated. In my limited experience, the appearance suggests a lesion like Coats's disease, rather than a tumor.

That the growth assumes a flat form instead of the globular projecting form which the sarcomata take, is due to the fact that the embolus lodges in a capillary, from which it breaks through. The proliferating cells occupy lymph spaces and naturally spread in these

* Read before the seventy-ninth annual meeting of the American Ophthalmological Society, at Hot Springs, Virginia, June, 1943.

spaces between the planes of the choroidal stroma.

Since the condition is a metastasis, removal of the eye is not necessary unless indicated by pain.

The two cases I wish to report are based on a clinical diagnosis only. In neither case was the eye removed, so that a pathologic examination was not made.

Case 1. Mrs. P. D., aged 59 years, was seen through the kindness of Dr. Robert Sullivan of Nashville, on December 1, 1942, in regard to the condition of her right eye. The vision in this eye had been defective for two months, and was about 1/200, excentric. She had had the right breast removed six years before, but, according to her statement, no pathologic examination was made. The operation was extensive, and she was told the trouble was malignant. The left eye was normal, vision 6/6 and presbyopic.

The right eye showed clear media and a normal disc. Beginning at the macular region, there was a yellow irregular mass, elevated 7D. The lower edge was sharply defined, and reached to the level of the disc. The elevated area extended upward in the central part of the field almost to the limit of the visible field. Transillumination did not show a shadow. Tension was normal. The field manifested a large central scotoma from the 5-degree circle above to 30 degrees in other directions. X-ray examination of the chest and extremities showed an area of destruction in the upper end of the left humerus, and in the distal end of the left clavicle, due to metastasis. There was a large amount of fluid in the left pleural cavity, and several metastatic nodules in the right lung.

The ocular lesion was regarded as metastatic carcinoma and no treatment was advised.

Case 2. Mrs. F. W., aged 46 years, wife of an Army officer, was seen in August, 1942, on account of a disturbance of the vision in the right eye. She had been in different Army hospitals, and had, as the beginning of her illness, amputation of the left breast for cancer in February, 1941. In 1942 she was admitted to another Army hospital because of aphonia, and tumor masses in the supraclavicular region. No biopsy specimen was taken for fear of accelerating the pathologic process, but X-ray therapy was given, and the masses subsided. She was discharged from this hospital on July 7th, the diagnosis being "carcinoma metastatic of pelvis, right femur, vertebral column, left supraclavicular region and elsewhere, secondary to carcinoma of the left breast." I saw this patient in August, 1942, and she was readmitted to the Army hospital in September for a few days' observation. X-ray studies at this time showed further involvement of the pelvis and first lumbar vertebra.

With the right eye the patient read 6/15 and J-14, unimproved. The field was irregularly contracted, 20 degrees up, 30 degrees in, 60 degrees out, with a large blind area from the blind spot downward. The media were clear. The disc was seen with a +3.00D. lens, and was observed to be elevated in the upper inner half, but sharply defined and not elevated in the lower outer half. The vessels passed forward abruptly up and in to +11.00D. The surface of this region was yellowish white, irregular and solid looking, not the usual appearance of a detached retina. The elevated area reached down to the ascending temporal vessels, which were seen with a +3.00D. lens. There was no hemorrhage nor exudation. The upper inner quadrant was dark to transillumination. The condition was considered metastatic carcinoma, and no treatment was advised. A fundus photograph was taken, but did not show the condition. The hoarseness was considered to be due to involvement of the recurrent laryngeal

nerve, as the larynx was not involved in the tumor.

This patient died in November, 1942. The affected eye had become entirely blind.

Her husband, as stated, was an Army officer, and among those who were at Bataan. No word was received from him after the fall of the Islands until a few days after the wife's death, namely December 9th, when he was reported a prisoner of the Japanese.

II. General metastasis from a melanoma of the abdominal wall, with external-rectus paresis

Case 3. G. F., an active and busy lawyer, aged 70 years, had had repeated ocular examinations during the last 20 years, and the eyes were found to be normal except for hyperopia and presbyopia. On December 4, 1939, he came for examination, saying that the night before while driving his car, he began to see double, and this had continued.

The vision was 6/6 with glasses. There was a slight arteriosclerosis of the retinal arteries, slight posterior central lens opacities, and a few vitreous opacities. Tension and pupils were normal.

There was constant homonymous diplopia, not increased in any direction of gaze. The images were fused with a 12$^{\Delta}$ prism, base out; motion was not impaired. Occlusion of one eye relieved the diplopia. There was no change in the condition till December 26th, when the patient became dizzy, and fell in his room. The following history of incidents, before and after I saw him, is pertinent to the eye symptoms.

In March, 1939, he had a pigmented mole removed from the abdominal wall by Dr. J. W. Snyder, of Miami, to whom I am indebted for the following notes:

The preoperative diagnosis was pigmented mole on the abdomen. Operation: removal of the mole. The mole was in the pubic region, and had recently shown some soreness with slight bleeding and irritation. The inguinal glands were not palpable, but malignancy was feared.

An elliptical incision was made around the mole, at no place nearer to it than 1½ cm. The entire thickness of the skin was removed in a single flap, by means of the high frequency current. The flaps were then undercut above and below, and the skin approximated under slight tension.

The specimen was examined by Dr. Phillip Resek, of Miami, who reported as follows:

"The specimen consists of a piece of skin, measuring 7 by 3½ cm. In the middle of this piece of skin, there is an elevated, brownish-red-pigmented granularlike area, measuring about 2 cm. in diameter. Within this naevuslike formation there is a wartlike tumor, which is also brownish red in color, and measures about 1 cm. in diameter. The cut surface shows that the cutis within this pigmented area is smaller than normal and atrophic.

"Sections of the mole show the epithelium of the skin near the mole to be very pigmented within the basal cells. The epithelium covering the mole itself is very irregular, and the interpapillary connective tissue presents a large number of chromatophores and fibroblasts, loaded with pigment. The tumor itself consists of typical naevus-cell nests, of which a few show a palisadelike arrangement, occasionally seen in medullary sarcoma without pigmentation. There are also numerous mitoses present. In one edge of the tumor, the hyperkeratotic epithelium penetrates the basal membrane, and becomes rather irregular.

"Diagnosis: Pigmented mole with beginning transformation into malignancy."

The sections were also examined by Dr.

H. C. Schmeisser, of the University of Tennessee, who reported as follows:

"Microscopic examination: The projecting portion of the section is covered with squamous epithelium, which is not taking an active part in the pathologic process. In the corium are closely packed cells, which in areas are spindle shaped and arranged in strands. They contain mostly large, pale, elongated nuclei, frequently large and hyperchromatic, with fairly frequent mitotic figures.

"In other areas, these cells have taken on a more rounded outline, and are larger, with large, pale, round nuclei, frequently hyperchromatic—sometimes with several nuclei in the same cells. Occasionally these cells show a finely granular brownish pigment. The supporting tissue is very delicate and insignificant. This pathologic process is limited to the corium. The continuing skin around the projecting portion shows the histology of a pigmented naevus.

"Diagnosis: Melanoma of the skin of the abdomen."

It will be noted that a wide excision of the growth was made, and X-ray treatment was advised, but the advice was not followed. The wound healed without trouble. The next incident was a visit to his physician, Dr. W. C. Cheney, on the same day that he consulted me, and the following note was furnished by Dr. Cheney:

"Mr. F. came to my office on December 4, 1939. He developed a pain in the left quadrant of his abdomen on the 9th of November. The pain was then referred to the left side of chest. He had no fever. Two weeks before coming to see me, he developed a lot of gas and vomited. He took a high enema, and got relief, and took phosphosoda with good results. His blood pressure was 180/104.

"On December 26th he became dizzy and fell in his room. It was recalled that he had had a chronic suppurative otitis media, but the ear had been dry for a number of years, and there were no signs of active trouble. X-ray examination of the head and body at that time was normal except for the skull, about which the report was as follows:

"Antero-posterior and lateral examination of the skull shows many irregular areas of bone absorption in all stages of development, scattered through the cranial bones. The process had all the essential characteristics of secondaries from a primary new growth.

"Stereoscopic X-ray study of the skull confirms the previous findings in skull. There is, however, a possibility of the skull process mentioned being primary, as a multiple myeloma."

The patient went to Florida, and the subsequent history is given in a letter from the physician who attended him there:

"On the morning of January 13th, Captain F. was seen and seemed to be a bit cloudy, although he did rouse up, smile, and answer questions with slight coaxing. His only difficulties were nausea, double vision, and a tendency to go to the left when walking. On the day before, that is, the 12th, he was at the Surf Club. The cloudiness continued during the 13th, although he was able to eat his meals and talk. At 7:30 that evening, he developed generalized convulsions, originating on the right. He was given sodium luminal by hypodermic. This failed to control the convulsions, and ether was employed by inhalation. This also failed to control them, and he was brought to the hospital.

"On arrival there, more sodium luminal was administered, and he was placed in an oxygen tent. Convulsions continued, temperature rose, and he was in a profuse perspiration. Thirty cubic centimeters of water-clear spinal fluid were removed from the spinal canal, but this did not alter the condition. Chloroform was then

used, and this, in turn, did not stop the convulsions. However, their intensity was greatly diminished by the use of sodium luminal, and on the following morning he was quiet, with an occasional tremor of the right foot. Bronchial breathing was found over the right upper lung. Anuria persisted from the 13th to the 15th, and the N.P.N. was increased to 96, with 3½ creatin. Blood sugar was 147, after intravenous glucose in saline had been employed.

"On the 16th, the tremor of the right hand had ceased, and urinary output had increased within the last 24 hours. The anuria occurred with the convulsions, temperature, and drenching sweats. That day, the respirations gradually became more superficial with development of pulmonary edema. Temperature at 3 p.m. was 107°, and respirations very superficial. Of course, if this man had not had the history of metastatic malignancy in this area, I would have uncovered the cortex on the left, as there seemed to be a rather definite picture of cortical irritation on the left. However, with definite evidence of malignancy, this seemed futile. Mr. F. died that day—no autopsy."

III. Rubeosis iridis, with melanoma of the choroid and secondary glaucoma

Case 4. D. S., aged 39 years, said that the vision in the right eye had been poor for many years, and the test when taken on his present examination was 20/200 in that eye. On December 24, 1942, he got some dust in the eye from the material on which he was working in a munitions plant. This dust was composed of aluminum, iron, and other ore dust. Examination in another city at that time showed the left eye to be blind, and he was advised to have it removed as there was a probability that it contained a tumor.

He was examined a month after this accident. The right eye was normal and hyperopic 2D. The left showed a dilated and fixed pupil—7 mm. in diameter—there were vitreous opacities and the details were very dim. The lower half of the retina was detached to the disc and in the extreme temporal field, an irregular yellowish area was seen. This part of the eye was dark on transillumination. Tension was 45 mm. Hg (Schiötz). The feature which is the occasion for presenting the history of this patient is the appearance of the iris. The narrow iris was almost covered with a net of superficial vessels, which lay on the surface of the iris, not in the stroma. In some respects it resembles rubeosis, but differs from the descriptions of rubeosis in that the vessels did not seem to be especially distributed around the pupillary margin, and the patient was not a diabetic. The widely dilated pupil may account for the vessels' apparently not being distributed near the pupillary margin.

The eye was removed. The following pathologic report was returned: *"Diagnosis:* Malignant melanoma, Callender spindle-cell, sub-type B, of the choroid. Vascularization of the anterior iris surface; glaucoma, detachment of the retina."

In regard to the iris, the report is as follows: "There is vascularization of the anterior surface of the iris. The greatest vascularity in the sections examined appears to be just peripheral to the sphincter muscle, on the side opposite the new growth."

A note was added by Colonel Ash, of the Army Medical Museum, as follows: "Although vascularization of the iris associated with glaucoma certainly makes one think first of diabetes, the condition is not absolutely confined to diabetics."

Duke-Elder has this to say about rubeosis of the iris: "The appearance of the iris is very striking, the surface being

festooned with new-formed vessels, especially near the sphincter region, when the individual branches anastomose to give the appearance of a ring."

Zeeman, in Berens's "The eye and its diseases," mentions rubeosis iridis, and says that its "occurring in a diabetic patient does not justify the diagnosis of iritis; it may indicate venous stasis in glaucoma."

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SURGICAL CONTROL OF GLAUCOMA IN THE NEGRO*

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The results of operations for glaucoma in the Negro are commonly supposed to be less successful than those of similar operations upon members of the white race. As a consequence of this belief many ophthalmic surgeons have discarded filtering operations upon the Negroes. In order to determine if such a defeatist attitude is justified, the following data from the Glaucoma Clinic of the Wilmer Institute have been assembled.

This analysis includes data from Negro patients who have been observed in the Glaucoma Clinic of the Wilmer Institute since 1934. A somewhat similar analysis of results in white patients at the Wilmer Institute was reported by Randolph and Robertson in 1942. Since there is a high percentage of Negroes in the population of Baltimore—about one third of the dispensary patients are colored—a comparable number of operations on Negro glaucoma patients are available for analysis.

An attempt was first made to classify the cases into early and late glaucoma as suggested by Reese,[1] and used by Randolph and Robertson[2] in their analysis, but this procedure was found to be of little statistical value because the number of early cases among colored patients was very small. Over 90 percent† of the colored patients came to the Clinic with far-advanced or absolute glaucoma, and only occasionally was early glaucoma observed in the second eye. Both Reese and Randolph pointed out that late glaucoma offers a poor operative risk. Thus, immediately, one possible explanation for the poor results in the colored race is encountered.

Material

The material on which this analysis is based is 70 cases of early and late congestive and noncongestive glaucoma in the Negro. These cases are presented as a group. They have all been followed postoperatively for at least one year and some for as long as eight years. All operations were performed by the resident house staff, and accurate records of pre- and postoperative vision, tension, and fields are available. Operative interference was instituted on all patients who

* From the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital.

† Eighty-three percent of the colored cases operated upon were far-advanced glaucoma; and over 7 percent were eyes considered hopelessly lost, and no filtering operation was done.

were losing either vision or fields, or in whom the tension was elevated above a level considered safe for that particular patient. In this last category are a few cases in which the tension could be controlled by strong miotics under a rigid hospital regimen but in which it was considered unwise to permit the patient to assume such a risk at home under less favorable conditions.

Of the 70 eyes on which operations were performed, 12 had congestive glaucoma and 58 had noncongestive glaucoma. Only 12, or 17 percent, could be classed as having early glaucoma. In addition to these 70 cases of primary glaucoma there is available in the Glaucoma Clinic a second group of 25 eyes with early and late secondary glaucoma. Although of different etiology, these were also treated by filtering operations.

The success of operations was judged by the following criteria: 1. The postoperative vision must closely approximate the preoperative vision and must be maintained unless reduced by some unrelated factor. 2. The visual fields must be maintained equal to those taken preoperatively. 3. The intraocular pressure must be consistently below 25 mm. Hg (Schiötz).

The use of miotics postoperatively is not a factor in this study, since the margin of safety in the dispensary patient is greatly increased by the use of pilocarpine, and postoperatively miotics were ordered almost routinely.

Operations on eyes with normal postoperative tension in which vision was lost, without some other apparent explanation, were considered failures.

Surgical technique

The operative procedures employed on these eyes included corneoscleral trephining, iridencleisis, iridotasis, cyclodialysis, and iridectomy. In the last year, a number of cyclodiathermies were performed, but since the follow-up period has not been adequate these cases are not included.

Before 1934, corneoscleral trephinings were generally preferred to iris-inclusion operations. Since that time, iris-inclusion operations have been favored. When gonioscopic studies indicated a shallow chamber with anterior synechiae, iridencleisis was the usual operation of choice, while for deep-angle glaucoma trephinings were employed.

The technique of the trephining operation varied with different operators chiefly in the degree of corneal splitting and a complete or a peripheral iridectomy. Either the hand or the Green automatic trephine[3] was used. No marked difference in results was apparent as a result of these variations. In all cases, a large, thick, conjunctival flap was dissected down. In some instances, the conjunctiva was first ballooned with novocaine to obtain a better plane of cleavage. At the end of the operation the eyes were usually dressed with eserine.

The technique of the iridencleisis was perhaps more uniform. A thick conjunctival flap was dissected down. This began at the insertion of the superior rectus muscle and was carried to about 2 mm. from the limbus. A keratome incision was then made, entering the anterior chamber as close to the root of the iris as possible. By depressing the posterior lip of the wound, the iris was prolapsed, was caught with iris forceps, and moved gently from side to side to break anterior synechiae. A radial cut was then made through the sphincter to the base. The pillars were spread, and the conjunctiva closed with a running black-silk suture. Atropine was used pre- and postoperatively to prevent pull on pillars.

A few iridotases are included in this series, but this procedure was used infrequently.

Iridectomies were of the classical type

TABLE 1

SEVENTY EYES IN THE NEGRO OF EARLY AND LATE PRIMARY GLAUCOMA TREATED BY FILTERING OPERATION

Success for One Year or More		Failure	
Number of Cases	Percentage	Number of Cases	Percentage
38	54.2	32	45.8

as described by von Graefe. They require no discussion, and, on the whole, the results in simple and chronic congestive glaucoma were most disheartening.

Trephining was the initial operation on 17 eyes, with success in 4 eyes, or 23 percent. An iris-inclusion operation was the first procedure on 47 eyes, with success in 24, or 51 percent. Iridectomies were done on 6 eyes, with failure in all cases (table 2).

Thus in 28 eyes, or 40 percent of the total, the glaucoma was adequately treated by one filtering operation (table 2). In the case of 42 eyes when the first operation failed, 12 patients either refused another operation or the condition of the eye was such that no further operation was indicated. The remaining 30 eyes, not controlled by the first operation, were subjected to one or more additional operations. In 10 cases these later operations were successful, and in 20 unsuccessful (table 3). In all, 82 operations were performed on these 30 eyes. The various operations used and the results in different operations are shown in table 4. Tre-

TABLE 2

FORTY PERCENT OF PRIMARY GLAUCOMA IN NEGROES CONTROLLED BY ONE FILTERING OPERATION

Type of Operation	Number of Eyes	Success for One or More Years		Failure	
		Number of Eyes	Percentage	Number of Eyes	Percentage
Trephining	17	4	23	13	77
Iris inclusion	47	24	51	23	49
Iridectomy	6	0	0	6	100
TOTAL	70	28	40	42	60

Cyclodialysis was rarely used as an initial operative procedure, but was frequently used as a secondary operation when some prior operation had failed. Other than anterior hemorrhages, which in no case caused the loss of the eye, this procedure has been surprisingly free from complications. The instrument designed by Randolph,[4] which permits the injection of air and saline into the anterior chamber, was frequently used with good results.

RESULTS

Of the 70 eyes with primary glaucoma subjected to one or more operative procedures, 38, or 54.28 percent (table 1), were successful during the period of observation, which was always a minimum of one year and in some cases five or more years.

TABLE 3

THIRTY EYES WHICH FAILED AT FIRST OPERATION WERE SUBJECTED TO SUBSEQUENT OPERATIVE PROCEDURES

Number of Eyes	Success for One or More Years		Failure	
	Number	Percentage	Number	Percentage
30	10	33	20	67

TABLE 4

EIGHTY-TWO OPERATIONS PERFORMED ON 30 EYES NOT CONTROLLED BY ONE FILTERING OPERATION

Number and Type of Operations Performed	Success for One of More Years	Failure
31 trephinings	5	26
23 cyclodialyses	4	19
20 iris inclusions	0	20
5 iridectomies	0	5
2 Lagrange	1	1
1 Seton operation	0	1
82 TOTAL OPERATIONS	10 (12 percent)	72 (88 percent)

phining and cyclodialysis are the operations of choice after one operative failure has been encountered. In the 10 eyes finally successfully controlled, an average of 3 operations per eye was necessary. In the 20 eyes unsuccessfully operated on the glaucoma was not controlled in spite of 52 various operative procedures. Eighty-eight percent of operative failure *per se* was thus encountered in this group. This figure obscures the fact that 33 percent of eyes not successfully controlled by one operation could be finally controlled, although an average of 3 operations per eye was necessary. It seems probable that this high percentage of failure of secondary operations, together with the fact that glaucoma in the Negro has usually progressed to the late stage, is the explanation for the general impression that operative interference in the Negro is doomed to failure.

The length of time the successfully operated cases have been followed in the Glaucoma Clinic is shown in table 5. Table 6 likewise shows when the operative procedure failed during the period of observation. Only four cases failed after three years and three of these were controlled by a second operative procedure and are still under observation.

In the second group, consisting of 25 cases of secondary glaucoma, the same

TABLE 5

PERIOD OF OBSERVATION OF 38 EYES SUCCESSFULLY OPERATED ON

Type of Operation	Number of Eyes	One Year	Two Years	Three Years	Four Years	Five Years
	Total	Number of Eyes	Number of Eyes	Number of Eyes	Number of Eyes	Number of Eyes
Trephining	9	5	2		1	1
Iris inclusion	24	6	4	8	2	4
Cyclodialysis	4	1	2			1
Lagrange	1		1			
TOTAL	38	12	9	8	3	6

TABLE 6

TIME OPERATIVE FAILURE WAS NOTED IN 42 CASES OF PRIMARY GLAUCOMA

Type of Operation	Number of Eyes	One Month	Six Months	One Year	Three Years	Four-Five Years
Trephining	13	10	1	1		1
Iris inclusion	23	9	10	1	1	2
Iridectomies	6	4	1	1		
TOTAL	42	23	12	3	1	3

criteria for success and failure were employed. Preoperatively all cases were uncontrolled by the usual supportive treatment. Operative success was 44 percent (table 7). The initial operation was successful in 9 eyes, or 36 percent. In 2 of the 16 eyes not controlled by one operative procedure further operation was successful.

The type of operation used as an initial procedure and the percentage of success are shown in table 8. As in primary glaucoma, iridencleisis gave better results. In 9 of the 16 eyes, when the first operation failed, later operations—6 trephinings, 3 cyclodialyses, and 2 iris-inclusion operations—were failures in all except 2 instances, both trephining operations.

The length of time that the cases were followed is shown in table 9.

The periods of time in which failure was noted in 16 eyes following the first operation are shown in table 10. In this group, 87 percent of the failures were noted in the first 6 months.

The complications which resulted in operative failure in both iris-inclusion operations and trephinings for either primary and secondary glaucoma are shown in table 11. In the iridencleisis operation, there was one case of sympathetic ophthalmia, both eyes having been subjected to operation, and both eyes were lost. The other operative complications noted did not result in the loss of the eyes, although the immediate operative results were unsuccessful. It is notable that in eight cases of anterior-chamber hemorrhages following iridencleises, operative failure resulted in only two cases.

The complications incident to trephining operations were more severe. In the three instances of prolapse of the ciliary body, the eye in only one case was saved

TABLE 7

OPERATIVE SUCCESS IN 25 CASES OF SECONDARY GLAUCOMA

Success		Failure	
Number	Percentage	Number	Percentage
11	44	14	56

TABLE 8

THIRTY-SIX PERCENT SECONDARY GLAUCOMA CONTROLLED BY ONE FILTERING OPERATION

Type of Operation	Number of Eyes	Success		Failure	
		Number	Percentage	Number	Percentage
Trephinings	5	1	20	4	80
Iris inclusions	13	7	54	6	46
Iridectomies	6	1	16	5	84
Cyclodialysis	1			1	100
TOTAL	25	9	36	16	64

TABLE 9

TIME OF OBSERVATION OF 11 SUCCESSFUL OPERATIVE CASES OF SECONDARY GLAUCOMA

Type of Operation	Number of Eyes	One Year	Two Years	Three Years	Four Years	Five or More Years
Trephining	3		2			1
Iris inclusion	7	2	1	1		3
Iridectomy	1		1			
TOTAL	11	2	4	1		4

TABLE 10

TIME OPERATIVE FAILURE WAS NOTED IN 16 EYES WITH SECONDARY GLAUCOMA

Type of Operation	One Month	Six Months	One Year	Three Years	Five Years
Trephining	2	1		1	
Iris inclusion	5			1	
Iridectomy	5				
Cyclodialysis	1				
TOTAL	13	1		2	

and useful vision retained. Anterior-chamber hemorrhages were encountered in five eyes with operative failure in three.

No case of late infection of the trephining bleb was encountered.

IRRADIATION

One of the most frequent causes of operative failure in filtering operations has been the obliteration of the filtering bleb by the scar-tissue formation. This appeared especially true in the Negro, who is subject to keloid formation. It therefore appeared quite logical to attempt to prevent such secondary cicatricial scarring by postoperative irradiation of the filtering bleb. To this end, irradiation with the beta rays of radon was employed, with the use of the convenient applicator designed by Dr. Curtis F. Burnam,[5] which has been used for other irradiation purposes in the Wilmer Institute since 1934. This postoperative treatment of the bleb in glaucoma cases is based on the well-substantiated experimental evidence[6,7] that fibroblastic activity is greatly retarded by irradiation.

In this series 11 eyes in Negroes were treated postoperatively with such beta irradiation. The results are shown in table 12. In 8 of these cases, the results were successful, and in 3 unsuccessful, although in none of the 3 failures was a postoperative tension greater than 35 mm. Hg (Schiötz) ever noted.

Although this series is too small for statistical significance, the results are encouraging. Reactions should be avoided. From experimental evidence on fibroblastic activity, probably the second, fifth, and twelfth postoperative days are the most favorable times for treatment. The radon applicator used in this Clinic is most convenient, but any radium appli-

TABLE 11

COMPLICATIONS ENCOUNTERED IN OPERATIONS ON 70 EYES OF CONGESTIVE AND NONCONGESTIVE AND 25 EYES WITH SECONDARY GLAUCOMA

Complications	Types of Operations			
	Iris Inclusions		Trephinings	
	Operation Failed	Eyes Lost	Operation Failed	Eyes Lost
Sympathetic ophthalmia		2		
Prolapse of ciliary body	1		1	Two eyes enucleated
Prolapse of iris	1		1	
Intraocular hemorrhage	2			Two eyes enucleated
Dislocated lens				One eye enucleated
Loss of vitreous			1	
Anterior-chamber hemorrhage	2		3	

cator for beta irradiation could be used. A total dosage between 16 and 20 gram seconds is probably sufficient.

Comparison of operative results in Caucasians in the Wilmer Institute, 1934-1942 (reported by Randolph and Robertson, 1942) and results in Negroes over a similar period

In 1942, Randolph and Robertson presented the operative results in 117 eyes with congestive and noncongestive glaucoma from the records of the Glaucoma Clinic of the Wilmer Institute. Fifty-six eyes were classed as presenting early glaucoma and 61 as late glaucoma. Randolph and Robertson emphasized the point that in the early group, trephining was successful in 79.3 percent and iridencleises in 85.4 percent of the cases, but in the late group both trephining and iridencleisis gave only 37 percent success. The type of operation was immaterial, but the time of operation was all-important.

The percentage of success in 117 Caucasions when not divided into early and late groups is approximately 59 percent. The Negro cases here reported, which were not classed as early and late glaucoma because of the small number of early cases, showed 54.2 percent success. This compares favorably with results in the white patients.

In Randolph's series, trephining and iridencleisis were almost on a par. In the colored cases, iridencleisis was a far more successful operation as an initial operative procedure, but trephining or cyclodialysis gave better results after one prior operative failure (see tables 2 and 4).

TABLE 12

Eleven eyes treated postoperatively with Beta irradiation

Case Name	Type of Glaucoma	Type of Operation	Postoperative Day of Irradiation	Total Dose gram seconds	Result	Time Followed years
1. A.P.	Early noncongestive	Iridencleisis	11, 18	33	Success	7
2. B.D.	Late noncongestive	Iridencleisis	4	16	Failure	5
3. S.S.	Late noncongestive	Iridencleisis	7, 14, 30	Treated at Kelly's Hosp.	Macular lesion? Failure	8
4. S.C.	Late noncongestive R.E.	Iridencleisis	2	6.7	Success	1 yr. and 10 months
5. S.L.	Late noncongestive L.E.	Iridencleisis	7, 14, 21	20.5	Success	3
S.L.	Late noncongestive R.E.	Iridencleisis	7, 14, 21	20.9	Success	1
6. J.P.	Late noncongestive L.E.	Iridencleisis	5, 12, 19	18.0	Success	1
J.P.	Late noncongestive	Iridencleisis	5, 12	13.1	Success	1
7. J.R.	Late congestive	Multiple operations Last, trephining	4, 11	16	Failure	2§
8. J.S.	Late congestive	Multiple operations Last, trephining	2	6.3	Success	2
9. G.C.	Late noncongestive	Multiple operations Last, Lagrange	2, 9, 16	12.5	Success	2

Conclusions

1. Primary glaucoma in the Negro was controlled in 54.2 percent of the cases by the filtering operation.

Secondary glaucoma was controlled in only 44 percent of the cases by the filtering operation.

2. Iridencleisis is superior to trephining as an initial operative procedure and the complications are less severe.

3. Trephining or cyclodialysis is the operation of choice as a second operative procedure after one operative failure.

4. When operative failure occurred, it was noted within the first six months in over 85 percent of the cases.

5. Postoperative beta irradiation of the blebs in filtering operations give encouraging results and is worthy of further trial.

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A REPORT ON A FAMILY WITH ECTOPIC LENSES*

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In recent years there have appeared numerous reports upon cases of ectopic lenses. Many of these have been associated with arachnoidactyly. One of the most complete reports is that of Burch[1] in 1936. There have been reports of several in one family, such as Lloyd's,[2] whose family of six showed that the mother and four children had this condition. The family I wish to place on record presents, so far as I can find, the largest incidence of this condition. There are 11 children in the family 8 of whom have misplaced lenses and a ninth has a small congenital cataract. No familial history could be elicited concerning the ancestors. The father died before an ophthalmologic examination could be arranged; however, there was no history of poor vision. The mother had entirely normal eyes.

In this family all the lenses were misplaced or ectopic and none were dislocated. By that is meant that the zonular fibers were still present on the side farthest removed from the ciliary processes, and the lens was firmly fixed in its abnormal position. Several in the group showed some evidence of arachnoidactyly in the elongation of the fingers and toes; none, however, showed any signs of a heart murmur either systolic or presystolic.

On account of the tendency of this condition to be transmitted, as shown in Mortons'[3] cases, where it occurred in 5 succeeding generations in 11 individuals, and very recently in those reported by Falls and Cotterman,[4] where in 5 generations 25 individuals were affected, although in some the diagnosis was not confirmed by examination (the largest number involved in one family was three), I advised the individuals of this group as they arrived at maturity to guard against pregnancy or having a family. However, the advice was not taken seriously, since both Joseph and Naomi have married and both produced offspring with normal eyes. Frances, who has a congenital cataract, has four children, one of whom is said to be deaf, but all have normally placed lenses. Elizabeth, the normal girl, has two sons who do not have misplaced lenses.

As is seen by the illustration nearly all the affected children had lenses misplaced

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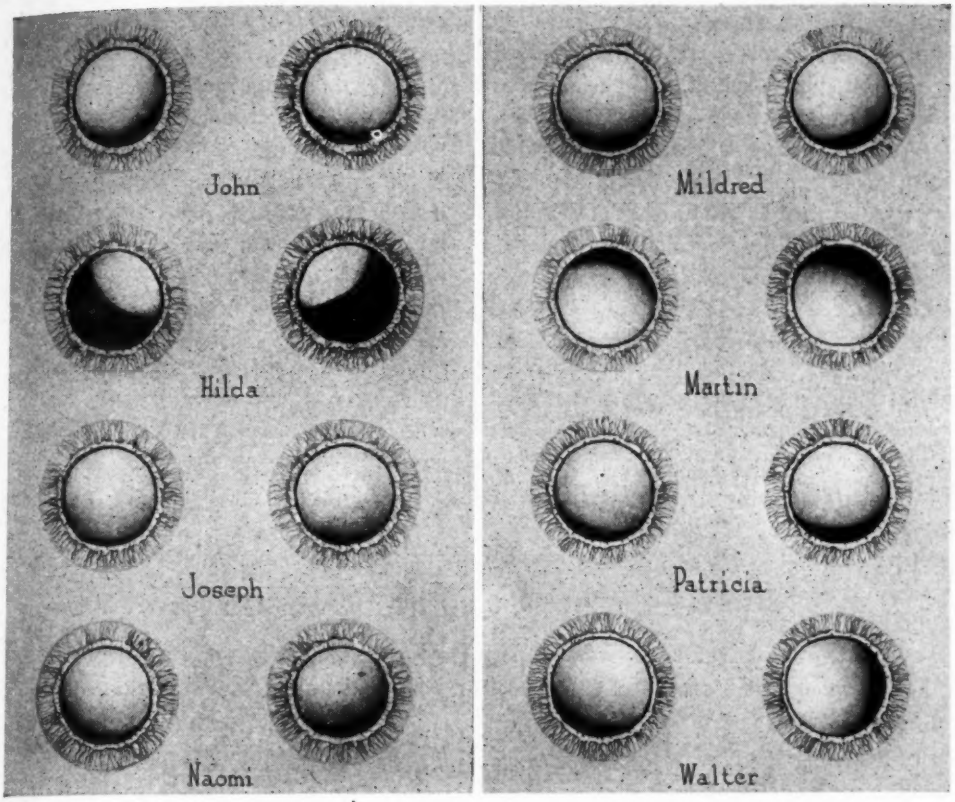
* From the Wilmer Ophthalmological Institute of the Johns Hopkins Hospital.



upward and for the most part slightly inward, although in Martin's case they were misplaced downward. All accepted a minus glass except Patricia, who took a plus one, even when the rays passed through the lens.

A brief eye summary of the findings in all the children's eyes follows:

1. John, aged 30 years. Vision O.D., with a −20D. sph. = 13/200; O.S., with a −14D. sph. = 5/200. The left eye turns in slightly. Both lenses are misplaced.

2. Elizabeth, aged 26 years, has normal eyes. She is married and has two children, who are said to have normal eyes.

3. Hilda is 25 years old. Vision O.D., with a −10D. sph. = 20/200; O.S., with a −10D. sph. = 20/200. She has the most extensive displacement of the lenses in all the family.

4. Joseph, aged 23 years. Vision O.D., with a +.75D. sph. ⌯ −1.75D. cyl. ax. 170° = 20/30; O.S., with a −4.50D. cyl. ax. 180° = 20/40. Both lenses are ectopic. He has been drafted into the Army; has one child, a girl, with no ectopia.

5. Frances, aged 21 years, has a small congenital lenticular opacity in the left eye at the posterior pole. She is married and has four children, one of whom is deaf, but all seem to have normal eyes.

6. Naomi is 18 years old. Vision O.D., with a −14D. sph. ⌯ −2D. cyl. ax. 60° = 20/100; O.S., with a −13D. sph. ⌯ −1D. cyl. ax. 130° = 20/100. Both lenses are ectopic. She has one child, a girl, who apparently has no ectopia.

7. Mildred, aged 15 years. Vision O.D., with a —12D. sph. ⌯ −3D. cyl. ax. 180° = 20/50; O.S., with a −8D. sph. ⌯ −5D. cyl. ax. 180° = 20/50. Both lenses are misplaced.

8. Martin, aged 13 years. Vision O.D., with a −15D. sph. = 20/200; O.S., with a −15D. sph. = 20/200. Both lenses are displaced downward.

9. Patricia, aged 11 years. Vision O.D., with a +5.50D. sph. = 20/100; O.S., with a +5.50D. sph. = 20/100. Both lenses are ectopic.

10. Walter, aged nine years. Vision O.D., with a −4.75D. sph. = 2/200; O.S., with a −4.75D. sph. ⊂ −3.25D. cyl. ax. 180° = 20/200. Both lenses are misplaced.

11. Jerome, aged eight years, has normal eyes as to ectopia.

While it would seem that in the case of Hilda an extraction or needling operation is indicated and, in fact, has been advised, the patient objects, and since prognosis is not good the procedure has not been urged. It will be interesting to watch for the condition in further descendants.

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A SIMPLE TEST FOR BINOCULAR FIXATION

Clinical application useful in the appraisal of ocular dominance, amblyopia ex anopsia, minimal strabismus, and malingering

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The refractionist in the Armed Forces sees cases of functionally poor vision whose total is out of all proportion to the number seen in civilian practice. This disproportion is due to the fact that every individual in the service is examined for visual acuity. Consequently, many of these, who under ordinary circumstances would never seek ocular advice, are concentrated in the eye clinics of the Medical Corps.

Needless to say, such cases take considerable time for evaluation and classification, especially since malingering and hysteria are so prevalent under circumstances of war-time anxiety. In the absence of demonstrable pathologic change or evidence of strabismus, the conscientious examiner struggles over and over again to ascertain whether the vision is as incorrectible as the patient claims. A simple test that could be completed in a few minutes, definitely proving in such cases that the patient pays attention primarily to the image in only one eye, would corroborate a diagnosis of amblyopia ex anopsia. Thus a basis for one type of functionally poor vision would be established, a diagnosis of amblyopia ex anopsia being inferred. The examiner would then be relieved of doubt as to the completeness of his examination and refraction and the feeling that these should be repeated. Many cases of amblyopia ex anopsia unassociated with demonstrable strabismus, and likewise many cases of minimal strabismus not readily recognized as such, would be uncovered by such a test. In these conditions convergence may be present, and the most meticulously performed cover test may fail to reveal any movement of the eyes suggesting a minimum strabismus, for the reason that the amblyopic eye makes no attempt to fixate.

Frequently the scotomatous macular area in this eye is held in line with the visual axis of the sighting eye so that observation of the position of the corneal reflexes as recommended by Krimsky[1] does not contribute to the differential diagnosis. Also Krimsky's method would not be helpful in cases in which the angle gamma is different in the two eyes, both of which are actually fixating.

The test is simply a clinical elaboration of a well-known observation that by placing a small prism before one eye disjugate movement of the eyes is elicited if fusion is present and conjugate movement if fusion is absent. It determines absence of binocular fixation, or suppression of one eye and dominance of the other, similarly to Verhoeff's image jump test (binocular phi phenomena[2]). This aspect of the test has the advantage of depending on an objective measurement (movement of the eyes) rather than a subjective sensation (movement of the image) and hence is easier to administer and requires less explanation. In addition, the subjective response of diplopia and movement of the images quantitates to a degree the extent to which the brain pays attention to the image of one eye over that of the other. Of course, from such a test one could not infer amblyopia ex anopsia in obvious strabismus patients, as these patients would always give an abnormal response which would be the same whether amblyopia existed or not.

Performance of the test

The patient is asked to fixate a small muscle light 20 feet distant, in a dimly lighted room, and a 4-diopter prism is moved back and forth in front of first one eye and then the other, all four positions of the prism being used, that is, base in, out, up, and down. The prism is moved with a snap so as to cover and uncover the eye at about two-second intervals, and the patient is asked what he sees. At the same time both eyes are observed carefully, particularly the eye not covered by the prism.

Normal response

If normal binocular vision with fusion is present, the patient will say that he sees two lights with the prism in any position, as the time interval is insufficient to allow him to fuse them into one. The new light is recognized as the one that is moving and is projected to right or left, up or down, depending on the position of the apex of the prism. It will be noted that neither eye moves when this rapid movement of the prism is made. If the prism remains in place the eye under the prism moves toward the apex, whereas the opposite eye, which is fixating the light, tends to remain stationary (disjugate movement of the eyes to fuse). Occasionally, there will be a slight wavering movement of the opposite eye as the brain may pay attention to the second image and the opposite eye moves conjugately. This movement can, however, be distinguished readily from that which occurs when the eye is inhibited to a degree or is not fixating, as would be the case in amblyopia ex anopsia or strabismus. The normal individual can easily distinguish the new light from the original, and he is simply asked to keep his attention on the original light, in which case his eyes will remain stationary.

The prism is now moved back and forth over the opposite eye and the patient is again asked what he sees and the eyes are observed. If normal binocular vision is present, the same response will be obtained for either eye.

Abnormal response

In cases when the image from one eye is completely ignored, or partially inhibited, as in amblyopia ex anopsia even

of the slightest degree, or the eye is not sighting, as in strabismus, the response of the patient as to the presence of diplopia plus the observation of the movement of the eyes is quite characteristic. When the prism is placed over the good or sighting eye, the patient will report that he sees one light moving back and forth in unison with the movement of the prism, in contrast to the diplopia reported in the normal; and this eye will be seen to move immediately toward the apex of the prism, and the amblyopic or nonsighting eye will move in the same direction, at the same time, and to the same degree (conjugate movement). It makes no difference in which of the four positions the prism is placed over the eye.

Now when the prism is placed over the amblyopic eye there will be no movement of this eye, as it is not fixating, and the opposite eye, which is fixating, will not move. The patient may or may not say that he sees double depending on the size and degree of the retinal scotoma or inhibition area present in this eye. That is, if the new image formed by the prism falls on a scotomatous area the patient will not see it, whereas if it falls on an area only slightly inhibited, the sudden stimulus with the prism may so increase the attention value that the inhibition is temporarily overcome and the patient sees the second light projected normally or abnormally, depending upon whether or not abnormal retinal correspondence exists.

It will be noted that cases of amblyopia ex anopsia and strabismus fall into definite groups relative to the ability of the subject to see diplopia with the prism over the nonfixating eye, when the above method is used. If an organic lesion is present, as a spot of choroiditis in the macular region, diplopia will not be seen unless the prism used is strong enough to throw the image on the normal retina. Using prisms of different strengths one can readily determine the size of the scotoma by this procedure. If the scotoma is only functional, it varies in degree in different cases of amblyopia and squint. For instance, certain squinters have a central scotoma in the macular region, whereas others have a marked area of suppression or scotoma at the point on the retina being stimulated in the squinting eye (the angle of squint). In the former cases the patient may say he sees double when the prism is placed so as to throw the image away from the macula, whereas he may see singly when the prism throws the image toward the macula. The reverse is true when the scotoma is at the angle of squint In some cases the entire area involved in the angle of the strabismus is so inhibited that no diplopia will be seen no matter which way the prism is placed, whereas in others the inhibition is so slight that diplopia may be elicited with the prism in all positions. Usually, in cases of horizontal strabismus, diplopia can be elicited readily when the prism is placed vertically, but only poorly when placed horizontally; whereas in cases of vertical strabismus, diplopia will be poorly elicited in the vertical meridian, as this area of the retina is inhibited. Frequently, a vertical strabismus can be suspected on this basis, and the cover test, with the eyes turned to right or left, may demonstrate a previously unsuspected vertical squint.

In simple amblyopia ex anopsia, without apparent squint, the ease with which diplopia can be elicited with a prism over the amblyopic eye will depend upon whether or not a previous squint has existed. In the average case one will find that diplopia can be elicited with the prism in some but not in all positions. However, it is to be noted that placing the prism over the sighting eye does not elicit diplopia but instead the response that the image moves back and forth. On rare oc-

casions, if the patient is unusually observant and the degree of amblyopia or inhibition very slight, the patient may note diplopia even when a prism is over the sighting eye; but in such cases the patient states that the original light moves in the direction of the apex and the new light appears in the direction of the base, the reverse of that seen in the normal. In other words, the patient is paying attention primarily to the original light which he sees move toward the apex, and as this eye moves the image from the amblyopic eye becomes apparent, the movement of this image lagging behind the original and consequently appearing in the direction of the base. In such cases, which are rare, one need not depend on the subjective findings, as the conjugate movement of the amblyopic eye is so characteristic as to distinguish the condition from normal (see case 4).

Since the degree of amblyopia is only relative it is best to perform the test under conditions that tend not to overcome the inhibition. For this reason, a dimly lighted rather than a dark room is preferable, for in the dark the stimulus from the second image is greater and therefore more noticeable, making the contrast from the normal situation less apparent. Likewise, the size of the prism is important. It is best to use a prism within the fusion range of the normal eye and yet strong enough to cause diplopia and noticeable movement of the eyes if moved rapidly enough not to allow fusion to take place. A 4-diopter prism meets these qualifications, as one can readily demonstrate by experimenting on his own eyes. Diplopia will be elicited readily and yet it can be overcome by fusion; and at the same time movement of the eyes can be easily seen. The conjugate movement, so characteristic of amblyopia, can be demonstrated by covering one eye and noticing how it moves under cover while the opposite eye moves to fixate when a prism is moved back and forth before it.

Prisms of other strengths can be used. For instance, normal individuals readily admit diplopia with a 2-diopter prism, but movement of the eyes of this degree is difficult to observe. However, if amblyopia with an extremely small scotoma is suspected, this strength prism could be used, the normal admitting diplopia readily, whereas the person with amblyopia would not. A larger prism, as 6 to 10 diopters, could be used to measure gross scotomata, but with prisms of such strength even normal binocular mechanism is disrupted to the extent that the eyes move, thus confusing the test if a gross scotoma were not present.

In actual practice, and after only slight experience, one can do the test very quickly, using only one or two positions of the prism in most instances to ascertain that the vision in one eye is being utilized or suppressed. Thus is determined the fact that the eyes behave either normally or abnormally, and the inference made therefrom that the poor vision acknowledged by the patient is either the result of hysteria or malingering, or that a basis for amblyopia ex anopsia of some degree exists.

Five typical cases are appended: Case 1—amblyopia ex anopsia with moderate inhibition, inhibition in the vertical meridian only; palsy of the inferior oblique muscle. Case 2—amblyopia ex anopsia with moderate inhibition. Case 3—amblyopia ex anopsia with marked inhibition. Case 4—amblyopia ex anopsia with minimum inhibition. Case 5—reduced vision in one eye without evidence of amblyopia ex anopsia.

Summary

A brief summary of the results of the test is simply that a prism, moved rapidly back and forth before an eye which is con-

tributing to normal binocular vision and fusion, causes diplopia to be noted and produces little or no movement of either eye. The same is true over whichever eye the prism is placed.

In amblyopia and strabismus, the prism moved in front of the sighting eye induces no diplopia but instead a to-and-fro movement of the image, and conjugate movement of the eyes; whereas a prism before the amblyopic or nonsighting eye may or may not induce diplopia, and results in little or no movement of either eye.

The above test, requiring no special equipment, provides a quick and decisive method for determining that binocular fixation and fusion are present or that suppression of one eye and dominance of the other exist, findings helpful in the differential diagnosis of amblyopia ex anopsia, minimum strabismus, malingering, or hysteria. In addition it indicates the degree of inhibition existing in amblyopia and strabismus, an estimation which might be of prognostic importance if the good eye were injured.

Illustrative cases

Case 1. J. M., presented a case of amblyopia ex anopsia with moderate inhibition, the inhibition being in the vertical meridians only; palsy of the inferior oblique muscle. O.S. was partially amblyopic; vision 20/100 with and without glasses; refraction was +2.00D. sph. ⊂⊃ −1.00D cyl. ax. 85°. O.D., vision 20/25; with +1.00D. sph. ⊂⊃ −.75D. cyl. ax. 105°, 20/20. In the primary position the patient's eyes fixated binocularly and converged normally. He was unable to discern depth with the new Verhoeff apparatus.[3]

Results of prism test. 1. When the prism was moved before sighting eye (O.D.), the patient saw no diplopia with the prism in any position, but reported that the image moved to and fro as the prism was moved back and forth in front of the eye. The observer noted that both eyes moved back and forth conjugately with the movement of the prism. 2. When the prism moved before the amblyopic eye (O.S.), the patient saw diplopia with the prism in the horizontal positions, the new image being in the direction of the apex of the prism; but with the prism in the vertical position the patient saw no diplopia. The observer noted no movement of the eyes when the prism was placed in any direction. Because of this finding the cover test was carefully repeated and it was noted that there was definite underaction of the left inferior oblique when the eyes were turned to the right. With the eyes turned to the right the left eye was slightly down, and when the patient attemped to look up and to the right, he was unable to elevate his left eye beyond the horizontal plane.

Case 2. A. K., presented a case of amblyopia ex anopsia with moderate inhibition. O.D. was amblyopic, vision 20/200 uncorrected; with +2.00D. sph. ⊂⊃ −2.00D. cyl. ax. 45°, 20/70. O.S., emmetropic, 20/15. There was no history of strabismus; the patient fixated binocularly; the eyes converged well; there was no depth perception as judged by the new Verhoeff apparatus.

Results of prism test. When the prism was moved over the sighting eye (O.S.), the patient saw no diplopia with the prism in any direction, but instead reported a single image moving in the direction of the apex of the prism. The observer noted that both eyes moved in the direction of the apex. 2. When the prism was moved over the amblyopic eye (O.D.) the patient saw a new image in the direction of the apex in all fields and the observer noted no movement of the eyes.

Case 3. G. S., presented a case of amblyopia ex anopsia with marked inhibition. O.D., vision was 20/20 and with

+1.50D. sph. ⌯ −.50D. cyl. ax. 170°, 20/20. O.S. was amblyopic; vision 10/200, and with +3.50D. sph. ⌯ −1.00D. cyl. ax. 15°, 10/200. The patient had a history of internal strabismus in childhood. His eyes were straight cosmetically at the time of this examination, and no movement of the eyes was noted on making the cover test. However, careful observation of the corneal reflexes showed eccentric fixation O.S. of about 5 prism diopters. Convergence was normal.

Results of prism test. 1. When the prism was moved before the sighting eye (O.D.), the patient saw the image move in the direction of the apex, and there was conjugate movement of the eyes in this direction whichever way the prism was turned. 2. When the prism was moved before the amblyopic eye (O.S.), the patient saw no change in the image (no diplopia) and there was no movement of the eyes. After considerable coaxing and with the room darkened, the patient thought he could see a dim second image when the prism was placed in vertical positions but was unable to see any semblance of diplopia with the prism in horizontal positions.

Case 4. D. M., presented a case of amblyopia ex anopsia with minimal inhibition. O.D. vision was 20/20, emmetropic. O.S. was amblyopic; vision 20/200 and with +1.25D. sph. ⌯ −5.00D. cyl. ax. 30°, 20/30−. There was no history of squint; the patient fixated binocularly and her eyes converged normally; angle gamma of O.D. was a larger positive angle than in O.S. There was no difference in response to this test whether correction was on or off. The patient had a degree of depth perception as judged by her ability to see Keystone DB 6 chart (figures 1, 2, 4, 5, and 6) correctly in the stereoscope; but was unable to see depth in the remainder and thought this to be so because the test objects were smaller. On the old Verhoeff card she saw bars in depth correctly. The new Verhoeff depth apparatus used in the other three cases was not available for use in this case.

Results of prism test. 1. When the prism was moved before the O.S. (amblyopic eye) base down, the patient saw a new light above; when it was base up, she saw a new light below; when base in, saw a new light to the left; when base out, saw a new light to the right. That is, when the prism was moved before the amblyopic eye, the patient's response was normal. She reported a new light in the direction of the apex of the prism, and the observer noted that there was no movement of the eyes. 2. When the prism was moved before the O.D. (sighting eye) base down, she saw a new light below; when base up, a new light was above; when base out, a new light was to the right; when base in, she saw only *one* light. There was no second image. The observer noted that the patient's eyes moved conjugately in the direction of the apex. When the prism was moved before the good eye the patient's subjective response was anomalous, as she reported a new light in direction of the *base* of the prism. Usually in amblyopia no second image is seen when the prism is placed over the sighting eye, but, instead, a to-and-fro movement of the original image as the prism is moved back and forth. The reason for the unexpected diplopia response in this case on moving the prism before the sighting eye may be explained as follows: When the prism was placed before the amblyopic eye, the patient saw the original image remain stationary while the new one appeared in the direction of the apex of the prism (observer noted that the eyes remained stationary). When the prism was placed before the sighting eye, the patient stated that the "original image moves" in the direction of the apex of the prism, and "a new image appears" in the

direction of the base of the prism, and "follows the other image" in the direction of the apex. The observer noted that the patient's eyes moved conjugately in the direction of the apex.

CASE 5. C. S., had reduced vision in one eye without evidence of amblyopia ex anopsia; no retinal inhibition; normal response to the test. O.D., vision was 20/70; with +2.00D. sph. ⌯ −3.00D. cyl. ax. 70°, 20/25. O.S., vision was 20/20, emmetropic. There was binocular fixation, normal convergence, and negligible lateral phoria. Depth perception was normal with and without glasses, as judged by Verhoeff's apparatus and the Howard-Dohlman test. However, performance on the Howard-Dohlman apparatus was better with the correcting lens on.

Results of prism test. 1. When the prism was moved before the O.D., the patient saw the second image in the direction of the apex with the prism held in any position, and there was no movement of the opposite eye. 2. When the prism was moved before the O.S., the patient saw a new image in the direction of the apex with the prism in any position, and there was no movement of the opposite eye.

Response then is that of a normal person with binocular vision and fusion and without any evidence of retinal inhibition, thus ruling out a diagnosis of amblyopia ex anopsia of the right eye.

One must assume in this case that, although there is reduced vision in the right eye, all the retinal elements contributing to the binocular image are active, and the brain is paying attention to the image of both eyes in the ultimate formation of the binocular image, even though one image is less distinct than the other. This condition differs from amblyopia ex anopsia of a minimal degree in that there is no evidence of inhibition of corresponding retinal points in the eye with poorer vision, as there is in amblyopia ex anopsia; and so binocular perception, fusion, and depth perception exist.

Hammer Field.

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RELATIONSHIP BETWEEN THE BACTERIOLOGY OF THE CONJUNCTIVA AND NASAL MUCOSA*

Especial reference to certain extraocular inflammatory diseases

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The significant role that foci of infection may play in the etiology of chronic and recurrent diseases in various parts of the body has become increasingly evident as a result of recent investigations and clinical observations.[1-10] It is recognized that even remote foci of infection are capable of damaging susceptible tissues or organs by the liberation of toxins that are circulated through the blood and lymphatic systems. Therefore, it would seem reasonable to suppose that an active, or even a latent, focus of infection might be particularly pathogenic for adjacent and communicating tissues or organs. This study was undertaken because clinical and preliminary bacteriologic findings suggested the possibility of a causal relationship between conjunctival and nasal infections. This report deals entirely with extraocular inflammatory diseases. Consequently, in those cases in which there was an intraocular involvement as well, bacteriologic studies were made during exacerbation of the extraocular condition.

In order to compare the bacteriologic flora of the two membranes, it was necessary to determine not only the type of organism or organisms present in each, but also the toxicity of each of the individual "strains." *In-vitro* methods, whereby a "strain" recovered from the conjunctiva could be identified with that found in the corresponding nasal membrane, would naturally be advantageous, even though the relationship between the two "strains" in such instances would be suggestive rather than conclusive. However, if in a large proportion of cases there should be a similarity between the flora of both the conjunctival and the corresponding nasal membranes, both as to type and toxicity of the bacteria, such a relationship might reasonably be assumed.

The word "toxicity" is used in this monograph to connote that general property of the microörganism which empowers it to damage tissues or to affect an animal or man adversely. Since there is considerable controversy among bacteriologists and immunologists regarding the precise significance of different tests involving pathogenic effects, or reactions associated with such effects, it might be more acceptable technically to use the term "probable pathogenicity." However, when a biochemical test is recognized as a reliable indicator of probable pathogenicity—as it is, for example, with the plasma-coagulating property of staphylococci—the test becomes, for practical purposes, a test of the "toxicity" of the culture.

In order to differentiate between the toxic and nontoxic strains of staphylococci, as well as to establish the degree of toxicity, the *in-vitro* methods advocated by Chapman, Berens, and their associates were used.[11-17] Certain of these *in-vitro* tests, such as mannitol fermentation, which was originally proposed by Julianelle,[18] and the coagulation of plasma, first shown by Darányi,[19] have been so improved that they are now recognized as

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indicators of probable pathogenicity by a number of investigators.[20-31]

In the early stages of this study, the pure strains of staphylococci found in cultures of the membranes were tested for the following properties: the ability to produce pigment, to coagulate rabbit or human plasma, to produce acid in 20 hours when grown on bacto phenol red

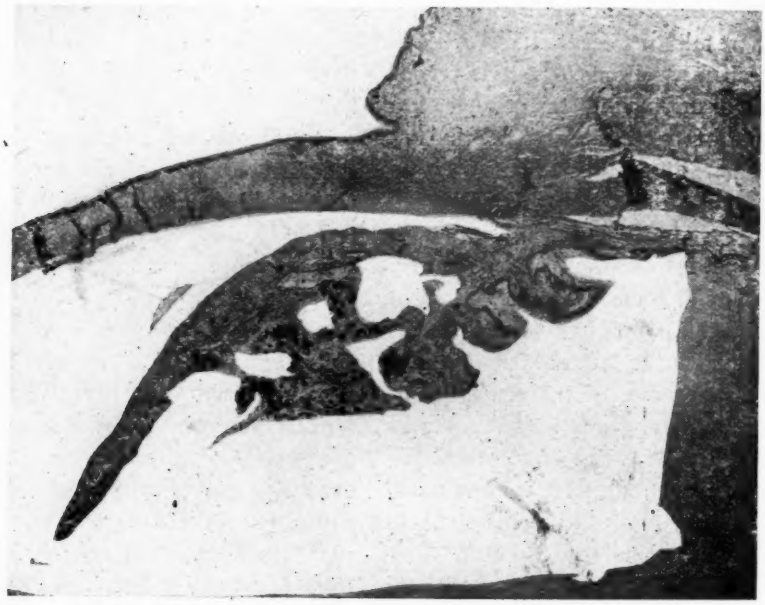

Fig. 1 (Berens and Nilson). Iridocyclitis in the anterior segment of a rabbit eye 24 hours after an intravenous injection of 1 c.c. of coliform bacteria. The animal lived for 24 hours. At the end of six hours the eyes showed marked injection of the vessels of the iris and clouding of the anterior chamber. Pathologic examination revealed edema, congestion of the vessels, and areas of hemorrhage in the ciliary processes. Fibrin and a few polymorphonuclear leukocytes were scattered through the interstitial tissues of the iris and the ciliary processes. The epithelium of the iris and ciliary processes was necrotic in a few places. In the anterior and posterior chambers a fine granular precipitate was noted. Gram-negative bacteria were observed in vessels of the ciliary processes in another section from the same animal.

mannitol agar,[17] to grow on alkaline brom-thymol-blue lactose agar,[17] and to hemolyze rabbit-blood agar. "Strains" were considered highly toxic when they were positive to all these tests, while typical nontoxic "strains" were negative throughout. However, there were a number of "strains" which were atypical in that they were positive for only some of the tests. Previous investigations[32] have shown that in the process of "degeneration" and dissociation, the pathogenic "strains" sometimes lose one or more of their original biochemical properties and some eventually become completely negative. Only rarely does a nonpathogenic "strain" assume the characteristics of a pathogenic "strain." Of all the tests, the most reliable indicator of toxicity, as determined by the results of intradermal tests on rabbits, appeared to be the coagulation of plasma.[32] In the absence of the coagulating factor, it appeared that hemolysin in aureus strains and mannitol fermentation in either albus or aureus strains indicated only slight pathogenicity.

The more recent of these studies of eye and nasal cultures were limited to tests for chromogenesis, hemolysin production,

mannitol fermentation, and coagulation of plasma. Since the coagulating "strains" were highly dermonecrotic for rabbits, a coagulase-positive "strain" was considered toxic, regardless of the remaining reactions. For this reason, a coagulase-negative "strain," even though it gave positive reactions to the other tests, was considered a degenerate "strain" of modified or doubtful toxicity. However, a coagulase-negative "strain," which was positive to several other *in-vitro* tests, strongly suggested that it may have been derived from a toxic parent "strain."

Streptococci were also tested for probable pathogenicity by *in-vitro* methods.[33, 34] These tests consisted of exposing the pure dissociants to 1:125,000 hexylresorcinol for two hours. "Strains" in which growth was not affected by this treatment were considered pathogenic. The results have been found to correlate well with the resistance of streptococcal "strains" to the bactericidal action of fresh, diluted, defibrinated guinea-pig blood, the method formerly used by us for determining probable pathogenicity.[35] These *in-vitro* tests have correlated well with pathogenicity of both live and killed organisms for animals[36] and have given more reliable results than those previously used; that is, the complement-fixation test,[37, 38] agglutination reactions, the "pathogen-selective method," and intradermal tests for sensitivity of the patient to his own bacteria.[39]

Unfortunately, no satisfactory *in-vitro*–pathogenicity tests have been devised for the few other types of organisms occasionally isolated from the eye and nasal membranes in these cases. Other than staphylococci and streptococci, the group of organisms most frequently encountered were those of the coliform group. To determine the pathogenic properties of this group it is necessary to resort to animal inoculation. In order to have the test conditions as nearly uniform as possible (the tests had to be made at different times whenever the organisms were isolated), a standard amount of "18-hour" broth culture of the freshly isolated strains was injected intravenously into rabbits of the *same age and weight* from the same genetic stock. It was shown that a moderate number of the coliform bacteria isolated from the eye or upper respiratory tract were quite toxic systemically for the rabbits, and that most of the strains produced a toxin having an unusually great affinity for the uveal tract, which manifested itself by the production of iridocyclitis[40] (fig. 1). The toxin rather than the organism itself appeared to be the agent mainly responsible for the uveal inflammation since in each case the filtrate alone was able to produce the same degree of iridocyclitis as did the corresponding amount of the culture from which it was derived. However, the intensity of the inflammation produced, as well as the general toxic effects, varied with the different strains of coliform bacteria.[40, 41]

The cultures reported in this study were taken according to clinical indications during the routine of private practice between April, 1939, and July, 1941. Conjunctival cultures were obtained by passing a dry, sterile, cotton swab along the lower cul-de-sac and the internal canthus. In cases in which the upper eyelid was involved, the upper tarsus was also swabbed. Material from hordeola and chalazia was cultured as expressed after incision. Nasal cultures were obtained by inserting a dry, sterile, cotton swab in front of the middle turbinate and then along the lower turbinate and the septum as far posteriorly as possible without shrinking the nasal membranes. A total of 83 sets of cultures was taken, each set consisting of a conjunctival culture from one or both eyes and a nasal culture from one or both nostrils. When the infection

appeared to be unilateral, the cultures usually were taken from the affected side only, although in several instances both sides were cultured for control purposes. The cases were divided into groups according to the bacteriologic findings. The eye conditions in which these cultures were taken were as follows: recurrent hordeola, chronic conjunctivitis, recurrent superficial keratitis, chronic meibomianitis and marginal blepharitis, allergic blepharoconjunctivitis, recurrent infected chalazia, and chronic purulent dacryocystitis.

Bacteriology of the Nasal Membranes

Cultures from the nasal membranes yielded one or more of the following organisms, each of which is discussed in regard to incidence and significance: staphylococci, streptococci, coliform bacteria, and enterococci.

Staphylococci. It has been well established that staphylococci are recovered from the nasal membranes more frequently than is any other type of bacterium.

Jacobson and Dick[42] in examining the nasal flora of 500 persons found *Staphylococcus albus* in all the cultures. However, they apparently made no attempt to differentiate between toxic and nontoxic "strains", even on the basis of chromogenesis. These authors quoted Neumann, who isolated *Staphylococcus albus* in 98 percent and *Staphylococcus aureus* in 30 percent of 200 nasal cultures. Gillespie, Devenish, and Cowan,[43] using the same methods as used by us for determining pathogenicity, found an incidence of 43.4 percent pathogenic staphylococci in nasal cultures from 159 apparently healthy students. Of the 83 nasal cultures in our present series, 71 (85.5 percent) yielded some type of staphylococcus, in either pure growth or mixed culture. The incidence of *"toxic"* staphylococci was 54 percent—36 of the nasal cultures yielding pure growths, whereas in 9 instances the pathogenic staphylococci were combined with other organisms. The organisms most frequently present in combination with staphylococci in the nasal membranes were streptococci (16 instances) and coliform bacteria (4 instances).

Streptococci. The presence of streptococci in either the nasal or conjunctival membranes was considered a pathologic sign whether or not the *in-vitro* tests indicated them to be pathogenic. We do not believe the streptococcus to be an inhabitant of normal basal membranes because of its low incidence in nasal cultures and the fact that it has usually been associated with pathologic clinical signs or symptoms. This opinion coincides with that of Jacobson and Dick,[42] who claimed that "the presence of streptococci, pneumococci, B. mucosus, Pfeiffer bacilli, and diphtheria bacilli indicates disease of the nasal mucosa or sinus disease or both." Of the 83 nasal cultures in our series, streptococci were found in 18 (22 percent), only 2 of which were in pure growth.

Coliform bacteria. The presence of coliform bacteria in any part of the upper respiratory tract has also commonly been associated with pathologic clinical signs or symptoms. For this reason, as well as because of the marked toxicity of upper-respiratory coliform bacteria, as compared with fecal strains for rabbits, their presence in the nasal cultures was considered pathologic.[40] Like the streptococcus, they are not normal inhabitants of the nasal membranes. Jacobson and Dick[42] found coliform bacteria in only 1.2 percent, although they quoted a figure of 11 percent in Neumann's series. In a previous study, which included nasopharyngeal as well as nasal cultures of

411 patients with eye complaints,[40] we found coliform bacteria of some type in 24.8 percent of the cultures. Of the 83 nasal cultures in the present series, coliform bacteria were found in 13 (15.7 percent), and, since these were from only 9 patients, the actual incidence was lower. In nine of the cultures, the coliform bacteria were present in pure growth, the remainder were in combination with staphylococci.

Enterococci. No reliable test has yet been devised to estimate the probable pathogenicity of enterococci. However, they were found in only one instance in the nasal cultures, and are, therefore, usually not of particular importance in ocular infections of possible nasal origin.

Discussion of the Bacteriology of the Nasal Membranes

Toxic organisms of some type were found in 67 (81 percent) of the 83 nasal cultures in this series. Toxic staphylococci were present in the major portion with an incidence of 54 percent. The remaining 27 percent were mixtures that included streptococci and coliform bacteria.

What the incidence of toxic organisms might be in the nasal membranes of a group of "normals" would be hard to estimate, owing to the difficulty in obtaining really normal controls. One of the factors contributing to this difficulty is the existence of latent or occult foci of infection; for example, silent sinusitis, which may produce iritis.[44] Another factor is the influence of climate or seasonal changes on the flora of the nasal membranes, which might produce immunologic changes in the mucosa or alter the pathogenicity of the organisms inhabiting the membranes, or both. A large proportion of the patients seen by us have eye involvements which we believe to be associated with infections of the upper respiratory tract, either in a primary or accessory role. Naturally these are the cases on which bacteriologic studies were made, and we have had little opportunity to study the nasal membranes of patients having no ocular pathology. However, in a number of cases in which the clinical appearance and ocular findings suggested a unilateral infection, the membranes on the unaffected side often yielded only nontoxic staphylococci, or a less toxic strain than that found on the side associated with ocular pathology.

Bacteriology of the Conjunctiva

Staphylococci. Nontoxic staphylococci are considered by most investigators as common and normal inhabitants of the conjunctiva.[45] In the present series, 84.3 percent of the 83 eye cultures yielded staphylococci of some type. In certain extraocular inflammatory diseases, toxic staphylococci are present more frequently than is any other single type of organism. Of 280 cases of blepharitis studied by Thygeson,[46] 259 yielded toxic staphylococci, the staphylococcus in the majority of instances being the only significant organism found. In a previous study, dealing with various types of conjunctivitis, Thygeson[45] found that in 399 cases of chronic conjunctivitis, *Staphylococcus aureus* was present in pure growth in 175 instances and in mixed growths in 13 instances, a total incidence of 47 percent. In our present series, in which a number of extraocular diseases besides conjunctivitis were included, 29 percent of the conjunctival cultures yielded toxic staphylococci, usually in pure growth.

Streptococci. McKee[47] found streptococci in 16 of 100 conjunctival cultures and considered their presence pathologically significant even when the eye was apparently symptomless. In the present series streptococci were found in only 6

(7 percent) of the 83 conjunctival cultures, once in pure growth, the remainder in combination with staphylococci. In contrast, they were present in 22 percent of the nasal cultures.

Coliform bacteria. Although coliform bacteria were found in the conjunctiva in pure growth in six cultures (7.2 percent), they represented only two cases, since repeated cultures were taken in both. The incidence is, therefore, lower than that in the nasal membranes, in which these bacteria were found in 13 (15.7 percent) of the nasal cultures, representing 9 cases.

Miscellaneous bacterial findings. Other organisms found in these conjunctival cultures were enterococci, which appeared in mixed cultures in three instances, once with toxic staphylococci, once with nontoxic staphylococci, and once with diphtheroids. In five instances the cultures were sterile for 72 hours, after which they were discarded.

Discussion of the bacteriology of the conjunctiva

The incidence of toxic organisms found in the conjunctival membranes of this series was considerably less than that found in the nasal membranes. Of the 83 eye cultures, only 34 (41 percent) showed toxic organisms of any kind, as compared with 81 percent in the nasal cultures. Of the 41-percent positive eye cultures, toxic staphylococci were most common, with an incidence of 29 percent. The remainder (12 percent) was equally divided between pure and mixed growths of coliform bacteria and streptococci.

In discussing Thygeson's work on bacteriologic differentiation of the common forms of conjunctivitis, Weih[45] contended that all these pathogenic bacteria are found in the conjunctival secretion in normal conditions. Our findings do not indicate this to be so. On the contrary, as can be seen from the present report, a large proportion of the patients with pathologic ocular changes failed to yield pathogenic organisms in the conjunctiva. This is to be expected in view of the greater exposure of the conjunctiva to oxygen as compared with the nasal membranes,* the lysozyme and other antibacterial factors in the tears as well as their mechanical action. There is also the possibility that in certain instances, the condition may be due to bacterial allergy rather than actual infection, to some other form of allergy, or to a virus infection. Thygeson, in referring to the normal flora of the conjunctiva, pointed out that "in a considerable proportion of cases no bacteria are to be found. . . . Diphtheroid bacilli and white staphylococci are the more or less constant inhabitants. In the majority of cases (results of routine bacteriologic examination prior to cataract extraction) no pathogenic bacteria are found. . . ." In our own preoperative cases only rarely is a toxic organism recovered from the conjunctiva of a patient whose eye, after careful examination, shows no clinical evidence of extraocular disease. Operation is usually postponed in those rare instances in which an apparently normal conjunctiva is found to harbor a pathogen. It is possible that postoperative infections such as reported by McKee[47] may be thereby averted. In such cases it is advisable to make careful bacteriologic study of the nasal membranes, lacrimal sac, the meibomian glands, and the retrotarsal folds of the conjunctiva. In our opinion the presence of toxic organisms in the conjunctiva should be considered and treated as a pathologic finding.

* The fact that the nasal membranes are half the time exposed to CO_2, a factor favorable to the growth of staphylococci, may be of some significance.

TABLE 1

GROUP 1

TOXIC ORGANISMS ISOLATED FROM BOTH NASAL AND CONJUNCTIVAL CULTURES
(31 SETS OF CULTURES)

Case No.	Date	Conjunctival Culture			Nasal Culture			Extraocular Diagnosis
		Eye	Type	Toxicity	Side	Type	Toxicity	
11	7/18/39	OU	S. albus	+++	Both	S. albus	+++	Chronic meibomianitis
16	2/ 8/39	OU	S. aureus	+++	Both	S. aureus	+++	Chronic recurrent parenchymatous keratitis. Conjunctivitis
31	2/ 7/41	OD	S. albus	+++	Right	S. albus	+++	Chronic meibomianitis, marg. blepharitis
37	5/ 9/40	OS	S. albus	+0+	Left	S. albus	+0+	Chronic conjunctivitis OS
41	3/13/39	OU	S. aureus	+++	Both	S. albus	0++	Infected meibomian gland
59	6/21/40	OS	S. albus	+0+	Left	S. albus	+0+	Allergic dermatitis of lids, blepharitis. Question of bacterial allergy
67	9/ 8/41	OU	S. aureus	+0+	Both	S. aureus	+++	Infected ammonia burns of cornea and lids associated with a cold
77	3/13/40	OS	S. aureus	+++	Left	S. aureus	+++	Chronic ulcerative marg. blepharitis OS Chronic meibomianitis
173	10/15/38	OD	S. albus	+++	Right	S. aureus	+++	Hordeolum-marginal blepharitis sicca. Abscesses of lids
173	11 /4 40	OU	S. aureus	+++	Both	S. aureus	+++	Hordeolum-marginal blepharitis sicca. Abscesses of lids
181	9/25/40	OS	S. aureus	+++	Both	S. aureus	+++	Allergic blepharoconjunctivitis
201	12/12/39	OU	S. aureus	+++	Both	S. aureus	+++	Acute conjunctivitis. Infected chalazion
229	12/20/39	OU	S. albus	+++	Both	S. albus	+++	Chronic meibomianitis—Folliculitis. Marginal blepharitis
244	4/26/39	OU	S. aureus	+++	Both	S. aureus	+++	Blepharitis
175	3/11/40	OD	S. aureus	+++	Right	S. aureus	+++	Allergic blepharitis, burning sandy feeling OD
178	1/ 5/39	OU	S. aureus	+++	Both	S. aureus	+++	Marginal blepharitis sicca
1	6/15/40	OS	B. proteus		Left	B. proteus		Styes, excessive tearing, and irritation
		OD	B. proteus		Right	B. proteus		
	11/29/40	OU	B. proteus		Both	B. proteus		
	3/ 1/41	OU	B. proteus		Both	B. proteus		
17	4/ 8/41	OU	Coliform bacteria		Both	Coliform bacteria		Keratitis (deep recurrent) OU
17	5/ 6/41	OU	Coliform bacteria		Both	Coliform bacteria		Keratitis (deep recurrent) OU
40	4/ 9/40	OU	S. aureus +++ S. viridans 8+		Both	S. aureus +++ S. viridans 8+		Folliculitis, chronic meibomianitis
51	11/28/41	OU	S. albus	+++	Both	S. viridans 6+ S. albus 0 0 +		Recurrent superficial punctate keratitis
70	2/26/41	OU	S. albus	+++	Both	S. viridans 8+ S. albus +++		Marginal ulcers. Keratitis
265	8/ 3/38	OS	S. aureus +++ S. viridans 8+		Both	S. aureus +++ S. viridans 8+		Allergic blepharitis. Infected chalazion
281	9/10/38	OU	S. albus +++ Non-hem. ent.		Both	S. aureus	+++	Chronic meibomianitis
287	12/ 4/38	OS	S. albus 0 0 0 Non-hem. strep. 6+		Left	S. albus 0 0 0 N. H. Strep. 6+ Diphtheroids (?)		Conjunctivitis
15	1/29/40	OS	S. aureus	+++	Both	B. proteus		Chronic meibomianitis
268	10/28/38	OU	S. viridans 4+ S. viridans 4+		Both	S. aureus +++ Coliform bacteria		OS bloodshot at times. Considerable congestion OU
218	7/12/40	OU	S. viridans ± S. albus 0 0 0		Both	S. albus	+++	Mild chronic meibomianitis Follicular conjunctivitis

Order of toxicity tests for staphylococci: (1) Mannitol fermentation, (2) Hemolysin, and (3) Coagulase. Designation of streptococcal pathogenicity 0 through 8+.

The presence of streptococci, whether toxic or not, is considered pathologic when found in the nasal or conjunctival membranes.

Comparison of bacteriology of the nasal membranes and conjunctiva

Group 1 consisted of 31 sets of cultures in which both the conjunctival and nasal membranes showed toxic organisms (table 1). Toxic staphylococci were found in both cultures in pure growth in 16 instances and in combination with streptococci in four instances. In three other instances, toxic staphylococci were present in only one of the cultures, the corresponding culture showing some other type of toxic organism. Coliform bacteria were found in pure growth in both nasal and eye cultures in six instances and in the culture from one membrane only in two instances; one in combination with toxic staphylococci, the other in pure growth. Streptococci were usually found in combination with toxic staphylococci, and in only one instance could they be suspected as the sole etiologic agent. Obviously the toxic staphylococcus predominates in this group, since of the 26 cases represented (two or more sets of cultures were taken in three cases), toxic staphylococci were present in one or both cultures in 23 cases. It will be noted in table 1 that the same organisms were present in both conjunctival and nasal membranes is pure growth in 22 instances, and at least one of the organisms was found in mixed growth in both cultures in 6 instances. Thus 28 of 31 sets of cultures showed a suggestive association between the flora of the nasal and conjunctival membranes. Equally suggestive is the fact that in most instances in which toxicity tests showed a strain of staphylococcus to be atypical, the characteristics in which it deviated from the normal were present in both the nasal and the eye strain; whereas in the case of streptococci, the degree of

TABLE 2

Nontoxic organisms of the same type isolated from both nasal and conjunctival cultures
or
Nontoxic organisms in nasal cultures with sterile eye cultures
(13 sets of cultures)

Case No.	Date	Conjunctival Culture			Nasal Culture			Extraocular Diagnosis
		Eye	Type	Toxicity	Side	Type	Toxicity	
48	4/ 2/38	OU	S. albus	0 0 0	Both	S. albus	0 + 0	Chronic meibomianitis
63	11/20/39	OU	S. albus	0 + 0	Both	S. albus	0 + 0	Allergic blepharitis
73	4/ 6/39	OU	S. albus	0 + 0	Both	S. albus	+ + 0	Recurring keratitis
71	2/ 4/41	OU	S. albus	0 0 0	Both	S. albus	0 0 0	Chronic conjunctivitis
83	5/15/40	OU	S. aureus	0 0 0	Both	S. albus	0 + 0	Keratoconjunctivitis—cause undetermined in 13 years.
138	5/19/39	OD	S. albus	0 0 0	Both	S. albus	0 0 0	Recurrent purulent conjunctivitis
228	12/18/39	OU	S. albus	0 + 0	Both	S. albus	0 + 0	Allergic blepharitis. Chronic meibomianitis
234	3/10/41	OU	S. albus	0 0 0	Both	S. albus	+ 0 0	Allergic dermatitis and blepharitis. Follicular conjunctivitis
270	1/12/38	OU	S. aureus	+ 0 0	Both	S. aureus S. albus	0 0 0 + 0 0	Blepharitis sicca—Conjunctivitis OU—Seborrhea capiti
287	12/ 4/38	OD	S. albus	0 0 0	Right	S. albus	0 0 0	Chronic conjunctivitis
51	6/11/40	OD	Sterile		Both	S. albus	0 + 0	Recurrent superficial punctate keratitis
271	3/ 1/39	OS	Sterile		Left	S. albus	0 0 0	Sandy feeling OS—lids puffy. Meibomian glands prominent
197	4/23/40	OD	S. albus Hemolytic enterococci	0 0 0	Both	Hemolytic enterococci Nonhem. enterococci		Vesicular and parenchymatous keratitis

TABLE 3

GROUP 3

TOXIC ORGANISMS ISOLATED FROM NASAL MEMBRANES AND NONTOXIC ORGANISMS FROM CORRESPONDING CONJUNCTIVAL MEMBRANES

(36 SETS OF CULTURES)

Case No.	Date	Conjunctival Culture			Nasal Culture			Extraocular Diagnosis
		Eye	Type	Toxicity	Side	Type	Toxicity	
3	3/21/40	OD	S. albus	0 0 0	Both	S. aureus	+++	Chronic meibomianitis
47	8/18/41	OU	S. albus	0 0 0	Both	S. albus S. aureus	+ 0 0 +++	
58	2/ 5/40	OU	S. albus	0 0 0	Both	S. aureus	+++	Chronic meibomianitis
60	5/20/41	OU	S. albus	0 0 0	Both	S. aureus	+++	Chronic conjunctivitis
78	1/27/39	OS	S. albus	0 + 0	Both	S. aureus	+++	Recurring keratitis chronic conjunctivitis
94	2/17/42	OD	S. aureus	0 + 0	Right	S. citreus	+++	Congestion of conjunctiva associated with glaucoma
105	11/10/39	OU	S. albus	+ + 0	Both	S. aureus	+++	Conjunctivitis OU
155	11/22/39	OU	S. albus	0 0 0	Both	S. aureus	+++	Marginal ulcers and blepharitis. Chronic meibomianitis, corneal ulcer
	2/15/40	OU	S. albus	0 0 0	Both	S. aureus	+++	
248	1/ 8/41	OU	S. albus	0 0 0	Both	S. aureus	+++	Recurrent chronic conjunctivitis
255	2/19/42	OD	S. albus	0 0 0	Right	S. aureus S. albus	+ 0 + +++	Eczematous conjunctivitis. Marginal blepharitis sicca–senile keratitis
256	9/ 6/40	OU	S. albus	0 0 0	Both	S. albus S. aureus	0 0 0 +++	? of vernal catarrh—itching, secretion OU
259	8/ 6/41	OD	S. albus	0 + 0	Both	S. aureus	+++	Dendritic keratitis, ulcer cornea. Allergic blepharitis with vesicles
85	2/23/39	OD	S. albus S. albus	0 0 0 0 + 0	Right	S. aureus S. albus S. albus	+++ 0 0 0 + 0 0	Infected chalazion
272	8/27/37	OS	Sterile		Both	S. aureus	+++	Scleritis
275	1/ 3/38	OU	S. albus	0 0 0	Both	S. albus S. aureus	0 0 0 +++	Allergic blepharoconjunctivitis
285	10/25/37	OD	S. albus	0 0 0	Both	S. aureus	+++	Calcareous conjunctivitis
32	5/ 1/39	OU	S. albus	0 0 0	Both	S. viridans S. aureus	0 +++	Blepharitis
106	2/20/42	OU	S. albus	0 0 0	Both	S. viridans S. aureus	0 +++	Acute conjunctivitis
227	3/17/39	OU	S. albus	0 0 0	Both	S. viridans S. aureus	0 +++	Chronic conjunctivitis
138	2/23/39	OU	S. albus	0 0 0	Both	S. viridans S. albus	8+ & 0 0 + 0	Recurrent mucopurulent conjunctivitis
222	11/18/40	OD	Sterile		Both	S. viridans S. albus	8+ 0 0 0	Chronic blepharoconjunctivitis
234	12/20/41	OU	S. albus	0 + 0	Both	S. viridans S. albus	0 & 8 0 + 0	Follicular conjunctivitis. Allergic dermatitis and blepharitis
235	11/16/39	OU	S. albus	0 0 0	Both	S. viridans S. albus 0 + 0 &	0 0 0 0	Chronic conjunctivitis OU
264	3/20/41	OU	S. albus	0 0 0	Both	S. viridans S. albus	8+ 0 0 0	Old fascicular keratitis.
270	1/11/38	OS	S. aureus	+ 0 0	Both	S. viridans S. albus	0 + 0 0	Seborrhea capitus—blepharitis sicca—conjunctivitis OU
278	12/21/38	OU	S. albus	0 + 0	Right	S. viridans S. albus	0 0 + 0	Dacryocystitis.
267	8/ 9/37	OU	S. albus	0 0 0	Both	S. viridans S. albus	0 0 0 0	Purulent dacryocystitis OS
180	10/25/40	OD	S. albus	0 0 0	Right	S. viridans	8+	Blepharoconjunctivitis

TABLE 3—*Continued*

Case No.	Date	Conjunctival Culture			Nasal Culture			Extraocular Diagnosis
		Eye	Type	Toxicity	Side	Type	Toxicity	
265	1/ 9/41	OU	S. albus	0 0 0	Both	S. viridans	0	Allergic blepharitis. Infected chalazion (recurrent)
	12/ 5/39	OD	S. albus	0 0 0	Both	Coliform bacteria S. albus	+++	
2	5/25/40	OU	S. albus	0 + 0	Both	Coliform bacteria S. albus	0 + 0	Chronic conjunctivitis, blepharitis and meibomianitis, Seborrhea capitus
169	2/ 4/42	OU	Sterile		Both	S. albus + 0 0 & Coliform bacteria S. albus	0 0 0 + 0 0	Chronic conjunctivitis OU
223	6/29/39	OU	S. albus	0 0 0	Both	Coliform bacteria		Chronic blepharitis and conjunctivitis
221	11/13/40	OU	S. albus	0 0 0	Both	Coliform bacteria		Chronic meibomianitis
284	3/10/38	OU	Diphtheroids Nonhem. enteroc.		Both	S. aureus	+++	Conjunctivitis OU

resistance to hexylresorcinol was usually the same in both ocular and nasal strains.

Group 2 consisted of 13 sets of cultures in which both nasal and conjunctival cultures were negative; that is, either sterile or showing nontoxic organisms (table 2). Of these, 10 showed a pure growth of nontoxic staphylococci in both cultures, 2 showed sterile eye cultures with nontoxic staphylococci in the corresponding nasal culture, and 1 showed enterococci in both cultures with the addition of nontoxic staphylococci in the nose.

Group 3 consisted of 36 sets of cultures in which the eye cultures were negative; that is, either sterile or containing nontoxic organisms, whereas the nasal cultures showed toxic organisms (table 3). Of the 36 eye cultures, 32 showed nontoxic *Staphylococcus albus,* 3 were sterile, and 1 showed a mixed culture of diphtheroids and nonhemolytic enterococci. Of the nasal cultures, toxic staphylococci were present in pure culture in 18 instances and in mixed culture in 4 instances, a total incidence of 61 percent. Streptococci were found in the nasal cultures in 13 instances, once in pure culture, the remainder in combination with staphylococci. There appeared to be a tendency for the staphylococci to be nontoxic in the presence of streptococci, since in only 3 of 11 instances were toxic staphylococci combined with streptococci. Coliform bacteria were found in the nasal cultures in 5 instances, twice in pure culture and the remainder in combination with staphylococci.

TABLE 4

GROUP 4

TOXIC ORGANISMS ISOLATED FROM CONJUNCTIVAL MEMBRANES AND NONTOXIC ORGANISMS FROM CORRESPONDING NASAL MEMBRANES (3 SETS OF CULTURES)

Case No.	Date	Conjunctival Culture			Nasal Culture			Extraocular Diagnosis
		Eye	Type	Toxicity	Side	Type	Toxicity	
140	12/10/38	OS	S. aureus S. aureus	+ 0 0 +++	Both	S. aureus	++0	Chronic conjunctivitis—superficial punctate keratitis
153	2/ 1/42	OS	S. albus	0 ++	Both	S. albus	0 0 0	Conjunctivitis after left antrum infection
269	11/10/37	OD OS	S. viridans S. albus	5 + 0 0 0	Both	S. aureus	++0	Chronic conjunctivitis after scarlet fever

Group 4, in which the eye cultures proved to be somewhat more toxic than the nasal cultures, consisted of only three sets of cultures (table 4). Even in these the difference between the toxicity of the two flora is not marked.

Discussion

In comparing the bacteriology of the nasal and conjunctival membranes, it may be seen from tables 1 and 3 that the nasal cultures tend to be more toxic than the conjunctival cultures. In groups 1 and 2 there was a definite bacteriologic relationship between the flora of the conjunctival and nasal membranes. It has been stressed[48] that this nose-to-eye relationship, as far as the bacteria themselves were concerned, was "mainly the fingers and handkerchief, from nose to eyelid margins and then to the conjunctiva." This, however, would not explain chronic unilateral eye conditions, which are so often associated with unilateral nasal conditions on the same side. In group 1, 28 of the 31 cultures showed strains of the same type and toxicity in both nasal and eye cultures, while only three sets of cultures showed toxic bacteria of different types in the nose and eye. In group 2, 11 of 13 cultures showed the same type of nontoxic organisms in both eye and nose while the two remaining eye cultures were sterile, with nontoxic bacteria in the corresponding nasal cultures. Thus, of 83 sets of cultures, 41 (50 percent) showed a definite relationship between the conjunctival and corresponding nasal culture.

In groups 3 and 4, there was no apparent relationship between the nasal and conjunctival findings. In group 3, all of the 36 nasal cultures showed toxic organisms, whereas the corresponding eye cultures were either sterile or showed only nontoxic organisms. This is an incidence of 43.3 percent showing toxic organisms in the nose with negative conjunctival findings. In group 4, the three eye cultures showed organisms somewhat more toxic than those found in the corresponding nasal cultures. This is an incidence of only 3.6 percent in which the conjunctival cultures could be considered more toxic than the nasal cultures.

The marked similarity of the findings in the corresponding nasal and eye cultures of groups 1 and 2 seems to denote a bacteriologic relationship. The negative findings in group 2 and the positive findings in group 1 are difficult to explain in view of the fact that on the whole the same type of clinical eye symptoms prevailed in both groups. A study of the records of these patients, however, reveals that in two instances these cultures were taken from the uninfected side of a unilateral eye infection, in two other instances earlier culture had yielded toxic organisms, and in another instance subsequent cultures proved to be toxic. Of the remaining eight sets of cultures, six had toxic organisms in the nasopharynx at the time, even though nasal cultures were negative, one had previously yielded toxic organisms in nasopharyngeal culture, and one had only nasal and conjunctival cultures so that nasopharyngeal bacteriology remained unknown; in this case, however, roentgenograms revealed infection in the left antrum.

Another question then arises as to whether the toxic organisms found in the nasal membranes of group 3 could be associated with the ocular pathologic changes in these patients in spite of the negative ocular-bacteria findings. Thygeson, in his paper on staphylococcus blepharitis[46] stated that 'there is no question but that *bacteria* may be the primary cause of inflammation of the lid margin." He had also stated in a previous paper[45] that "the clinical picture of staphylococcus conjunctivitis has been reproduced in man

and animals by instillations of *exotoxin.*" The work of Morax and Elmassian[49] supports this contention; they produced acute conjunctivitis in man and animals by the instillation of broth filtrates. Allen[50] also produced acute conjunctivitis by instillations of staphylococcus toxin. Toxic staphylococci are capable of producing a potent exotoxin. It seems logical to believe that some of the potent staphylococcal exotoxin, produced in nasal or sinus membranes, might find its way into the conjunctiva or the surrounding glands and tissues. That toxins do reach the conjunctiva is suggested by the fact that in so many of these patients, exacerbation of the ocular condition followed closely or coincided with a nasal "flare-up," sinusitis, or a "cold," in which the nasal membranes were involved. Also, treatment of the nasal infection in chronic cases is often followed by improvement or eradication of the eye condition. An example of this may be seen in cases of recurrent hordeola, in which it is difficult to obtain viable organisms at the time of rupture, since by that time most of the bacteria have been phagocytosed. On the assumption that a toxic staphylococcus is usually the etiologic agent in the production of hordeola, and since the *nasal* passages usually yield a toxic staphylococcus in these cases, we have sometimes made vaccines from the nasal staphylococci. From the study of clinical records, these vaccines apparently have proved fully as beneficial in preventing recurrence of hordeola as those prepared from conjunctival strains when they were obtainable.

The question has been raised as to the route by which the toxin produced in the nasal membranes might reach the eye, and the lacrimal duct has been considered as one possible avenue. Thygeson[48] believes this to be "theoretically impossible owing to the constant flow of tears in the opposite direction." However, in many of these cases we have observed partial or complete obstruction of the lacrimal duct, with epiphora, which usually indicates disease. Furthermore, the flow of tears would not seem to be of sufficient force to sweep back approaching toxins or bacteria but only sufficient to keep the mucous membrane moist, a condition favorable to the transfer of these substances. Another possible way in which the nasal toxins might affect the eye is by causing reflex irritation, thus disturbing the vasomotor mechanism. Stauffer[51] believes this reflex stimulation causes nutritional disturbance, which, in turn, impairs the function of the organ, thus producing various diseases. He further states that while diseases of the eye may be produced by reflex irritation alone, they are most frequent when the nerve supply to the part is impaired by direct transfusion of toxins from adjacent suppurating cells. The blood and lymph have also been mentioned as possible channels for the distribution of toxin, but, even in these, proximity of the source might play an important role in affecting adjacent organs.

Probably the most significant findings in this study are those recorded in table 4, which show that in only 3 of 83 sets of cultures could the eye culture be considered more toxic than the nasal culture, and even in these, the difference was slight. This strongly suggests that the eye condition in most of these cases was endogenous and that the primary cause was an infection from the nasal membranes rather than an infection from external foci such as the scalp or skin.

Thygeson[46] suggested that overactivity or altered activity of the glands of the eyelid margin may be a predisposing factor in staphylococcus blepharitis. However, he conceded that "seborrhea does not appear to be necessary to the production of staphylococcus blepharitis," and that in his series "there were a number of individuals without seborrheic skins or scalps and with normal meibomian

glands." In considering the etiology of these extraocular inflammatory diseases, it would, therefore, seem more logical to suspect nasal infections as primary foci, in some cases, rather than the surrounding external tissues or glands. It is not suggested that all persons having nasal infections will eventually have extraocular infections because the latter is only one of many possible effects. That the released toxins may be capable of causing intraocular involvement or any of a number of diseases in other parts of the body, as well as extraocular disease, is readily admitted. However, in view of the bacteriologic findings in this series of cases, it would seem advisable to culture the nasal membranes when investigating the etiology of chronic or recurrent inflammatory diseases of the outer eye. Examination and roentgenograms of the sinuses and nasal membranes show that in the majority of these cases, the clinical findings support the bacteriologic data.

Summary and Conclusions

1. Of the 83 sets of cultures taken from the nasal and conjunctival membranes of 75 patients with extraocular diseases, 50 percent yielded organisms similar in type and toxicity in both conjunctival and corresponding nasal cultures, 43.3 percent yielded "toxic" nasal cultures with corresponding "negative" conjunctival cultures, and approximately 3.5 percent yielded organisms of slightly greater toxicity in the eye than in the nose.

2. That 50 percent of these patients showed similar organisms in both nasal and conjunctival cultures suggests a bacteriologic relationship between the two membranes. It is significant that in those instances in which the strains were atypical in their *in-vitro* reactions, this deviation from normal was generally found in both the nasal and the corresponding conjunctival strain.

3. That the nasal culture should prove more toxic than the eye culture in over 43 percent of the patients with extraocular inflammatory diseases suggests that the nasal membranes may be the primary foci in these cases. It would seem logical to suppose that the toxin produced in the nasal membranes might easily find its way to the conjunctival membrane, even if the bacteria do not, and that repeated penetration of the toxin might sensitize the conjunctival membranes and surrounding glands.

4. The fact that 96.5 percent of these cultures showed organisms of equal or greater toxicity in the nose as compared with the eye, and that in only 3.5 percent were the conjunctival cultures more toxic than the nasal cultures suggests that the primary source of infection is endogenous rather than exogenous.

5. The bacteriologic relationship between nasal and conjunctival infections is substantiated by clinical symptoms and signs of pathology in many cases in which nasal exacerbations coincide with or are closely followed by ocular symptoms.

6. In determining the etiology of chronic and recurrent extraocular inflammatory diseases, it is advisable to investigate the nasal mucosa as a possible source of infection.

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NOTES, CASES, INSTRUMENTS

ADIE'S SYNDROME

A CASE REPORT

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The syndrome of Adie has attracted considerable interest of late, the recent paper of Dynes being an especially lucid presentation of the history and peculiarities of the symptom complex bearing this eponym. The reader is referred to the appended references for a fuller description, but emphasis on the main features may not be amiss before presenting the case report which forms the main purpose of this paper.

Adie's syndrome consists of myotonia of the pupil, mostly unilateral, usually but not necessarily accompanied by absence of one or more of the deep tendon reflexes. These are commonly the knee and ankle responses. The tonicity of the pupil results in dilatation with absent or delayed response to light and normal or exaggerated normal accommodation reflex. The condition mimics and is often mistaken for tabes, but differs from it in several important respects. In the Adie syndrome both the blood and spinal fluid are serologically negative, and the pupillary fixation to light is often unilateral. It is obvious that a knowledge of the syndrome is important if the physician would avoid attaching the stigma of tabes to patients with this condition.

The case reported in this paper is one of unusually long duration. Aside from this it has no very unusual features, being, in the author's opinion, a classical example of the condition.

M. S. was born into a large family, living in the country on a small farm. He had the usual childhood diseases and at the age of three had an attack of pneumonia, and another attack of the same disease at the age of five. During his childhood he carried out a fairly strenuous work routine, but remained in good health until he was 14 years old. At that time he began to have attacks of sciatica, first on one side, and then the other, but more frequently on the left. These attacks recurred for many years and then ceased altogether. At the age of 17 years he sustained an injury to the left side of his head as the result of a fall from a horse. Although he was able to remount the horse and continue on his journey after the fall, he was apparently unable to remember the purpose of his travel. This was the only symptom connected with the injury, and he continued in good health, entered college, and became active in sports while there.

After completing his studies at college and medical college, and an interneship, he entered the Army Medical Corps in 1900. It was during his period as a student at the Army Medical School in Washington, D.C., that he first noticed the wide dilatation of the pupil of his left eye. Thinking that he had accidentally splashed a mydriatic into his eye, he waited two or three days for the pupil to return to normal, but at the end of this time it was in the same stage of dilatation. He then consulted a specialist, underwent a thorough physical examination and it was found at this time that in addition to the dilatation of the pupil, there was absence of the left patellar reflex and reduction of the right. The tendo achillis and cremasteric reflexes were normal, and there were no areas of paresthesia nor anesthesia on any region of the body. The pupil of the left eye remained fixed, and no reaction could be elicited, even with a

strong light, although the other pupil reacted to light both directly and consensually. Under a mydriatic the pupil of the left eye dilated to the same degree as the right but was slower in contracting after the effect of the drug had ceased. The left pupil also contracted under a miotic. Close examination revealed slight contraction in accommodation, slight dilatation to darkness, and sluggish reaction upon entering a well-lighted room. Biateral vision was 20/15, and there was no difficulty in close accommodation. The eyegrounds were normal, and, aside from the aforedescribed symptoms, no pathologic changes were found. The pupil gradually contracted until it was slightly larger than the right during the day and smaller in a shaded room.

Many examinations were undergone and many specialists consulted in an effort to ascertain the etiology of these findings. The results of tests of the blood and spinal fluid, made on many occasions, were always negative. No definite diagnosis was established.

From the onset of these symptoms to the present time, a period of some forty-odd years, I have examined the patient on many occasions. No other symptoms nor signs have ever developed, and he has been able to carry out his daily activities without difficulty of any kind.

The fact that the symptoms and signs have remained unchanged over such a long period of time suggests that the syndrome remains stable when it has become well established. Since the etiology of the condition is unknown, the history of trauma in this patient may be of some importance. It is not the author's intention to attempt any generalizations based on the history of one patient, and the function of this report must remain that of the presentation of an interesting and illustrative case report and a reminder that this condition is frequently mistaken for a much more serious and disturbing malady.

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TREATMENT OF EPITHELIAL INGROWTH FOLLOWING CATARACT EXTRACTION

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The wild growth of epithelial tissue into the anterior chamber is a serious complication of intraocular surgery and perforating injuries of the anterior segment of the eyeball. The actual causative factor is unknown. Its occurrence is infrequent. It is realized, however, that if not treated, the eye is destroyed by secondary glaucoma, because the tissue proliferates to fill the angle.

Previous to the recent use of the X ray and radium, attempts at surgical removal have been more or less futile, owing to the very nature of the disease. As the disease entity may have been started by a single misplaced epithelial cell, it would entail great manipulation to try to remove every last cell of this wild-growing tissue.

The use of the X ray is doubly advantageous here in that it obviates the necessity of opening the eye a second time—generally more hazardous than the original operation. It also acts to destroy those rapidly proliferating cells much more thoroughly than would be possible by the aid of the human eye, and without damaging normal cellular tissue, so long as the proper dosage is employed. Perera[1] has reported a case treated by the X ray and has reviewed the subject recently.

The case of the patient whose history follows differs from the usual course in several respects. The treatment was instituted earlier following operation, the initial dosage was greater, and only one course of X-ray treatments was necessary to bring about a cure. It was felt that these factors were important because the less differentiated and younger the cells are the more sensitive they are to X-ray irradiation. Secondly, it is felt that as large a dose should be used initially as is compatible in order to destroy this tissue without exposing normal cells to its destructive effect.

G. C. D., a man, aged 47 years, had gradually lost the sight of his right eye during the year previous to operation. Examination showed a cortical cataract with good light perception and projection. The past history was chiefly negative, except that he had also had a cataract in his left eye one year earlier, extracted by the writer without complication; resulting vision was 20/20 with correction.

The right eye was operated on on March 24, 1943, an intracapsular extraction and total iridectomy being performed. Recovery was uneventful and the patient was discharged from the hospital on April 5, 1943. On April 15th, a faint white membrane was observed in the anterior chamber, growing down from the corneoscleral junction at the 12-o'clock position. There were no signs of inflammation. This condition was kept under observation until April 20th, and its slow progress downward noted. X-ray irradiation was begun on this date by Dr. C. R. Crain. It was decided to use 200r for the first dosage, and a weekly treatment of 150r for four more exposures. At the end of the week the tissue had not advanced farther and was beginning to disappear. Complete recovery took place thereafter, and, when last seen, on December 1, 1943, the eye showed no evidence of recurrence. The vision in this eye with +11.00D. sph. ⊂⊃ +1.25D. cyl. ax. 180° was 20/20.

Summary. A case of epithelial ingrowth into the anterior chamber of the eye following cataract extraction is reported.

Its successful treatment by X-ray irradiation is outlined.

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REFERENCE

Perera, C. A. Amer. Jour. Ophth., 1938, v. 21, p. 605.

SOCIETY PROCEEDINGS

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ROYAL SOCIETY OF MEDICINE

SECTION OF OPHTHALMOLOGY

November 13, 1942

MR. FRANK A. JULER, *president*

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RETINOSCOPY

MR. M. KLEIN said that the principle underlying clinical measurement of the "refraction" of the eye is to determine the position of the image in space of a light source which in this case is the retina. In practice the determination of the image is very difficult. In retinoscopy the aperture test is used, by means of which it is possible to determine the "crossing point"; that is, the image plane of a light pencil.

In this presentation the retinoscopic field can be dispensed with, and the mirror-hole itself substituted for it. Another factor is the speed of shadow movement. The emitted light pencil is divergent in hypermetropia, convergent in myopia, but beyond the crossing point this becomes divergent again. With the increase of the refractive error the convergency or divergency of the light pencil increases. When spectacle lenses are placed before the eye, and the refractive error is being corrected, the area of the light pencil becomes smaller and smaller, and very little movement of the mirror will be sufficient to pass the light pencil over the mirror-hole (increase of speed).

The next factor is the brightness of the pupillary light, which is subdivided into four separate factors: (1) Brightness of the source, which, if increased, will increase the illumination of the retinal light patch: (2) distances which cause a decrease in illumination with the square of the distance; (3) apertures which consist of the edge of the mirror, the patient's pupil, and the mirror-hole or the examiner's pupil; (4) losses in transmission, which are caused by imperfect reflection and by absorption of light.

Still another factor is the neutral point, and the question as to why there is a sudden change of shadow and light at the neutral point was discussed. At the neutral point there are no confusion circles, and the area of an image element is so small that when it passes the aperture at all, it passes entirely. This means that the light patch on the retina appears or disappears suddenly. Another question that arises is what happens in the examiner's eye during retinoscopy. If the refractive error of the patient's eye is high, the examiner can see fundus details. As the refractive error is being corrected in the course of retinoscopy, the fundus details become more and more blurred, because the examiner's eye is unable to bring the emitted light pencil to an image. Factors influencing the neutral point are aberration, decentration of the cornea, and the unevenness of the retinal surface.

INTRAOCULAR NEOPLASM

S/LDR. G. WILLOUBY CASHELL presented the case of a 37-year-old corporal. In 1940 he was struck in the right eye with an empty cartridge case. Apart from momentary blurring of vision he had had no trouble with the eye and since then had been serving overseas. After his return to this country the eye remained satisfactory until September, 1942, when he noticed a slight haziness in vision. At the

same time he noticed flashes of light in the right eye, especially at night. He had had no trouble with the left eye.

On examination the left eye was found to be in good condition with vision of 6/6. The pupil was normal and the media and fundus were clear.

The vision in the right eye was 6/24. He had never worn glasses. The pupil was active and the ocular movements were full. Examination of the fundus of the right eye revealed above the disc and macula a circular cystlike detachment of the retina. No hole could be seen, the lower part of the cyst appeared to be transparent, but along the upper border there was a grayish-white reflex with some proliferation of pigment. Transillumination threw an opaque shadow in the upper part of the globe. The peripheral visual field was full, but there was a scotoma corresponding to the affected area of the retina. There was a shallow detachment of the lower part of the retina.

On general medical examination no evidence of metastases was found. X-ray studies of the skull and chest were normal. Ear, nose, and throat examination was negative.

A diagnosis of choroidal sarcoma of the right eye was made.

Discussion. Mr. Juler said that he thought this case was one of malignant melanoma which should be excised.

S/Ldr. Cashell said that a similar case was shown by Air Commodore Livingston, which was taken to be innocent, but later the growth increased and the eye had to be enucleated. It was found to contain a neoplasm.

Mr. G. W. Black said he had seen a 22-year-old man who was hospitalized following a blow on his eye from a large missile. He was treated for a time and then it was discovered that the vision was very dim. When he first saw the patient the latter had a large sarcoma.

Chiasmal arachnoiditis

Dr. A. J. B. Goldsmith gave a sketch of the history of the development of the syndrome of chiasmal arachnoiditis, a localized meningitis.

The essayist added three cases, the first of these with headache, pituitary and anterior hypothalamic symptoms. This patient had loss of vision in the right eye with some temporal contraction in the left eye. Temporal pallor of the discs was marked. Many fine avascular adhesions bound the pink nerves and anterior chiasm to the overlying brain, internal carotid artery, and diaphragma sellae.

The second patient complained of headaches and vertigo. The vision in the right eye was reduced to the perception of hand movements. In the left eye the visual field was concentrically constricted. The disc of the right eye was pale, that of the left normal. There was also involvement of the right first, fifth, and eighth nerves. Exposure of the area at operation revealed the optic nerve of the right eye to be covered with convoluted vessels and adhesions which bound both nerves, chiasm, brain, and internal carotid arteries. Some fluid was found loculated between the optic nerve of the right eye and the carotid artery.

The third patient also had headaches with edema of both papillae. Vision was reduced to perception of hand movements in the right eye and to 6/60 in the left eye. Peripheral visual fields were normal, but a large central scotoma was found with the right eye, and a small central scotoma with the left eye. At operation the pink nerves and chiasm were bound by a mass of fine adhesions to the overlying brain.

The usual findings in chiasmatic arachnoiditis, and further borne out by these cases, are as follows: There is frequently observed upon ophthalmoscopic examination an early congestion of the papillae, and a later atrophic pallor. Operation

usually reveals fine adhesions which are generally rather extensive in the chiasmal area, binding the nerves, chiasm, dorsum sellae, carotid arteries, and base of the brain. These adhesions may be vascular or avascular. Cystic fluid or calcareous plaques may be found. In these cases tumors have been excluded.

Attributing causes are: (1) inflammatory extension from nasal sinuses; (2) syphilitic basal arachnoiditis in the chiasmal area; (3) tuberculosis and other leptomeningitic infections; and (4) trauma.

Loss of vision is usually found first in one eye. The visual field defects are: (1) central scotoma; (2) concentric contractions; (3) temporal loss; and (4) nasal, altitudinal, and homonymous defects.

The optic nerve shows (1) primary atrophy; (2) secondary (postpapillitic) atrophy; (3) papilledema; (4) temporal pallor; and (5) normal.

Generally headache is a frequent cause of complaint. Symptoms from pituitary and anterior hypothalamic (autonomic nervous system) involvement may be found. Neurologic and roentgenologic examination is usually negative.

Chiasmal arachnoiditis should be differentiated from the demyelinating diseases, toxic neuritis, syphilis, vascular atrophy, and Leber's disease.

Chiasmal arachnoiditis is a disease of early adult life (20 to 40 years) and occurs more frequently in males than in females (2 to 1).

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

February 1, 1943

DR. ISADORE GIVNER, *presiding*

THE RICKETTSIAE IN OPHTHALMOLOGY

DRS. H. P. VENABLE and F. J. POLLOCK reviewed the literature on rickettsiae. A discussion of the morphologic, cultural, and staining properties of rickettsiae in general was followed by a more detailed analysis of the ophthalmologic manifestations of these organisms. Viruses, bacteria, and rickettsiae were differentiated.

Animal and human experiments on rickettsial diseases were described with special emphasis on Nagayo's work on tsutsugamushi fever, the characteristic microscopic lesions being: (1) invasion of the endothelial cells of the cornea and (2) abundant nodule formation in the iris, ciliary body, and cornea. The etiology of trachoma (virus or rickettsia) was discussed in detail. The ocular manifestations of human rickettsial diseases were presented, especially in typhus fever.

The conclusions were: (1) A comprehensive review of the literature supports the fact that rickettsiae are different from viruses and bacteria. (2) Coles believes that rickettsiae may cause conjunctivitis in different animals. Johnson has shown that pannus formation in sheep can be caused by rickettsial organisms. (3) Nagayo has experimentally produced the ocular lesions of tsutsugamushi fever in the rabbit with injections of rickettsial organisms into the anterior chamber. (4) The wide difference of opinion as to the viral or rickettsial origin of trachoma may be due to interpretation. Experimental work on humans has been insufficient to draw any conclusions. (5) Of the known human rickettsial diseases, typhus fever causes the most characteristic ocular changes.

RECURRENT ALTERNATING EXOPHTHALMOS

DR. SIGMUND A. AGATSTON reported the case of a 55-year-old man who was first seen in May, 1942, with unilateral exophthalmos of the left eye and who gave a history of proptosis of the right eye three years previously, clearing up

spontaneously in three weeks. Exophthalmometer readings were: R.E. 20.5 mm.; L.E. 24.4 mm. There was conjunctival chemosis and prolapse, and marked limitation of motion, especially in the sphere of action of the lateral rectus. Pressure over the globe did not elicit pain. Uncorrected vision in each eye was 20/30. Fundus examination revealed senile retinal arteriosclerosis, with slight engorgement of retinal veins and moderate hypertensive changes. The intraocular pressure, pupils, and visual-field studies were normal. General examination disclosed no abnormality other than a blood-pressure reading of 180/120. Urinalysis, blood count and chemistry, and Wassermann reaction were all normal. The allergy clinic reported no special sensitivity. Basal metabolic rate the first time was +37 but a second test showed only +6. X-ray examination of the sinuses revealed: Frontals, well developed and slightly cloudy; ethmoids, cloudy, especially the left; sphenoids, small and cloudy; antra, clear. The antra were irrigated and found clear.

Treatment was directed toward cleansing of the conjunctiva. During three weeks following the first visit, the proptosis spontaneously receded to normal with return to normal motility.

In October, 1942, the right eye became swollen, and the patient showed proptosis and chemosis similar to those seen in the left eye five months previously. Vision was unchanged and exophthalmometer readings were: R.E. 24 mm., L.E. 21 mm. The patient was referred to the Ear, Nose, and Throat Clinic where X-ray studies of the sinuses revealed no change in the picture. A diagnosis of sphenoethmoiditis was made, and the patient was given a course of sulfadiazene therapy. After two weeks the chemosis gradually disappeared, although the exophthalmometer reading was still 23 mm. for the right eye. Ocular motility returned to normal. During the hospital stay there was a constant diurnal spiking of the temperature, which, however, never rose above 100°F.

Retrobulbar inflammation, neoplasm, gumma, thyrotoxicosis, allergy, and arteriovenous aneurysm were ruled out as etiologic factors. Evidence pointed to engorgement of the retrobulbar venous system resulting in swelling of the tissues. This condition seems to be secondary to periodic blocking in drainage of diseased sinuses. This type of exophthalmos has been reported by John E. Weeks and others. This case was seen at the New York Eye and Ear Infirmary.

Discussion. Dr. Daniel Kravitz said acute exophthalmos may be due to an inflammatory or toxic reaction, possibly thyrotoxicosis, or from a hemorrhage behind the eyeball. It seemed unlikely that exophthalmos secondary to acute sinus disease would appear acutely, recede, reappear, and again subside, particularly without fever. Exophthalmos due to sinusitis is serious and usually requires operation on the sinus or incision of the orbit with evacuation of pus. The recurrent proptosis in this case might have been due to some form of toxemia.

Juvenile cataract in association with dermatosis (syndermatogenous cataract)

Dr. Daniel M. Rolett presented a case, which was reported in this Journal (1944, April, p. 389).

Discussion. Dr. Truman Boyes said the patient in the case reported by Dr. Rolett was in the same age group as those in the three cases he and Dr. McDannald reported in 1942. The cataract that develops in these cases is comparable to the traumatic type, as emphasized by Alan

Woods, who felt that since the crystalline lens and ciliary epithelium are developed from ectoderm, allergens in the aqueous could affect the lens capsule and cause cortical cataract.

Dr. Boyce said these patients have a nervous, unstable background as well as an allergic factor. In practically all of the reported cases the condition occurred in previously normal eyes. The majority are between 12 and 25 years of age, and the lens changes are deep in the anterior and posterior cortex. First, there are grayish-white dots which gradually become confluent and later a mature grayish-white cataract develops. The postoperative results are good, and in his case the cataract was removed with a resultant corrected vision of 20/20. Lens changes in the other eye were rather stationary, possibly due, in part, to general treatment with sedatives and vitamins. Pregnancy did not influence the progress of the cataract.

Dr. Sigmund Agatston said that with Dr. Gartner he reported a few years ago, on the cases of two brothers, Rothmund or Werner's syndrome. These patients were about 50 years old and showed, in addition to marked scleroderma, the characteristics of early aging, stunted growth, and early graying of the hair. Senile cataracts had already developed. He emphasized that this condition may also be seen in older patients.

Dr. Milton Berliner said he had just operated on a patient with syndermatogenous cataract in one eye and bilateral keratoconus. He thought it would be interesting to determine whether there is any association between the two conditions.

Transillumination in eye tumors

Dr. Ralph I. Lloyd read a paper on this subject which was published in this Journal (August, 1943).

Thrombosis of the central retinal vein treated with heparin

Dr. Daniel Kravitz reported the case of a 54-year-old woman, seen on October 11, 1942, who complained of a sudden reduction of vision to light perception in the right eye. A thrombosis of the right inferior temporal vein with massive hemorhages in the macular area was present. The patient had advanced vascular sclerosis. The patient received eight daily doses of heparin of 100 mg. each. By November 18th vision had improved to 20/70, and there were no signs of hemorrhages. When last seen on January 17, 1943, the vision was 20/70+ and there were a number of black pigment spots in the area.

Dr. Kravitz felt that heparin has been given in such large doses that untoward effects resulted, such as visceral hemorrhages. These cases have been reported. He felt it unnecessary to prolong the coagulation time beyond 8 to 10 minutes. The patient can be successfully treated while going about his regular business.

Dr. Edward Saskin said these cases prove the value of heparin in central-vein block, stating that this is a practical method of treatment for ambulatory patients. He mentioned several other cases which responded favorably to heparin therapy. Dicoumarin, administered orally, may also be used for these cases. There is a latent period of 36 to 48 hours until its cumulative effect appears. The prothrombin time, normally 20 seconds, can be prolonged to as high as 80 seconds if proper care is not taken. Dangerous and uncontrollable hemorrhages may appear if the prothrombin time exceeds 35 to 40 seconds. Physiologically dicoumarin prevents prothrombin formation, destroys it, or attenuates its action. It may be used in conjunction with heparin by administering the latter intravenously and following

with dicoumarin orally. Prothrombin time should be determined daily. These drugs should be considered in the treatment of central-artery occlusion secondary to thrombosis elsewhere in the body.

Dr. James W. Smith asked whether Dr. Kravitz had figures on untreated cases, or, for comparison, cases treated without heparin. He also asked about the relationship between the interval elapsing from the time of occurrence of the thrombosis and commencement of therapy and the ultimate results.

Dr. Sigmund A. Agatston wished to know how heparin worked. In diabetes with vein involvement and thrombosis, prothrombin time is normal. He wondered how it dissolved a thrombus, how it affected an already thrombosed vein and stated that it would appear that after one or two weeks, if the retina is damaged, recovery could not occur.

Dr. Kravitz said that without treatment the hemorrhages following thrombosis take many months to resolve. In many instances they do not resolve at all. He has never seen a case of complete thrombosis ever get well and has never seen any restoration of vision in partial thrombosis with massive hemorrhages in the macular area. Since enucleation for secondary glaucoma is not unusual, any treatment which will save an eye is worthwhile. He has supervised treatment of a patient in which complete thrombosis had occurred three months previously. The hemorrhages disappeared in a short time, and, though vision was limited to light perception, he felt a possible enucleation was avoided. Heparin either prevents thrombin formation or dissolves the newly formed clots. When a thrombus forms there is an immediate piling up of new thrombus along the course of the vein. Heparin prevents this piling up, and if it dissolves the newly formed clot, there is a better chance of canalization. He has never seen newly formed blood vessels act as new channels in these cases.

Achromatopsia, a report of three cases

Dr. Joseph Mandelbaum said achromatopsia, or complete color blindness, is a clinical syndrome which includes the symptoms of diminished visual acuity, photophobia, a shift of the visibility curve toward the shorter wave lengths, and ocular nystagmus. The term monochromatism may best be applied to those atypical cases where the other features of photopic vision are retained. With Dr. Samuel D. Lewis, Dr. Mandelbaum studied three siblings of French-Canadian derivation, in whose maternal ancestry the syndrome was transmitted as a simple recessive characteristic. They exhibited all the symptoms of achromatopsia including the shift in visibility curve, which was measured on a Helmholtz color mixer. Their visibility curves closely matched the normal scotopic curve, whose peak is at 510 millimicrons, although photopic levels of illumination were employed, which in normal eyes give a peak at 555 millimicrons. Nevertheless their dark-adaptation curves showed two components, similar to the normal cone and rod curves. This may be explained by one of two suppositions: (1) In the achromatic eye there may be two types of rod cells, adaptation occurring more rapidly in one cell and replacing rapid cone adaptation, which would be a valuable asset, for it would avoid a prolonged period of relative blindness following the exposure to a bright light; or (2) a few cone cells are present in peripheral areas of the retina. These last cells may have been sufficient to take over the visual function during the early period of dark adaptation when the rods are completely inactivated, but too few to affect the visibility curve.

Discussion. Dr. Charles Haig felt that

the scotopic form of the visibility curve excludes any possibility of cone function in these cases. The supposition that there are two types of rod cells is more probable. This was his conclusion in a similar case of achromatopsia, where, although the dark-adaptation curve was single and showed only rod function, the intensity-discrimination studies showed two distinct curves. The belief that there were two types of rod cells was confirmed by the presence of a double curve when red light was used, for red light always gives single functions with normal rods and cones.

DIPLOPIA FOLLOWING SPINAL ANESTHESIA —PARALYSIS OF LATERAL RECTUS, LEFT EYE

DR. LOUIS R. LANG stated that from a review of the literature it would appear that cranial-nerve palsies following spinal anesthesia are rare. The abducens nerve is the most frequently involved. In a study of 88 cases, Blatt found involvement of the trochlear 4 times, the oculomotor 6, and the abducens 78, 18 of the last named being bilateral. The interval between anesthesia and palsy was 3 to 14 days, averaging 7, and the paralysis cleared up in one week to three months, only rarely lasting longer. The incidence has been placed by various investigators as once in 700 spinal anesthesias.

Several theories have been advanced for the causation of this phenomenon. These include faulty technique (Evans); a mild meningitic reaction (Rolett); hemorrhage (Adams); hypertension of the cerebrospinal fluid (Robay); degeneration of the ganglion cells (Kostor); and cerebral edema. The sixth nerve is particularly susceptible to trauma because of its superficial position in the fourth ventricle, and because of its long and exposed course. The treatment of these cases is conservative, since they clear up eventually, leaving no sequelae.

Dr. Lang described the case of a man, aged 51 years, who had received 50 mg. of novocaine dissolved in 2 c.c. of spinal fluid as anesthesia prior to hemorrhoidectomy. Nine days later he complained of seeing double, and examination disclosed a paralysis of the external rectus muscle of the left eye. Neurologic examination was otherwise negative, all reflexes being present and active. General physical examination, blood Wassermann test, and urinalysis were negative. The visual acuity was 20/20 in each eye. Pupillary findings, fundus examination, and visual-field studies were normal.

There was no improvement in the patient's condition until almost four weeks later when the left eye could be abducted 2 mm. beyond the midline. Further improvement was rapid and five weeks after the injection diplopia could not be elicited with the red glass.

Discussion. Dr. Alfred Kestenbaum said that there are two groups of these cases: one following spinal anesthesia, and the other, less frequent, after simple lumbar puncture. In the cases he observed the paresis commenced five to nine days following puncture and was more or less cured after about six weeks. The mechanism of this condition is not clear; all explanations are hypotheses, as there are no anatomic findings. However, there seems to be a real and important entity consisting of abducens paresis occurring 5 to 12 days after a lumbar puncture and lasting about six weeks. In every case of abducens paresis we should therefore inquire about a recent lumbar puncture and consider it in our diagnosis and prognosis.

Dr. Henry Minsky pointed out that it is worth determining which is the dominant eye in treating tropias and occluding the other for greater comfort.

Dr. Joseph Mandelbaum had two re-

cent cases of this condition in which he used prisms to eliminate the diplopia. The patients preferred this very much to occlusion.

Dr. Frieda Mark said she saw a patient in 1936 with an external rectus paresis following spinal anesthesia and that six years later, when last observed, the patient still had diplopia.

Dr. Lang pointed out that external rectus paralysis after simple spinal puncture is very rare. He had seen one case of diplopia lasting a year after the spinal anesthesia and another one, he stated, was reported to have lasted for 18 months. He said Dr. Kestenbaum suggested giving these patients glasses in which the outer half of the glass in front of the involved eye is occluded, thereby eliminating diplopia in the affected field.

Leon H. Ehrlich,
Secretary.

SAINT LOUIS OPHTHALMIC SOCIETY

February 23, 1943

Dr. Carl Beisbarth, *president*

Epidemic keratoconjunctivitis

Major Murray Sanders (MC), by invitation, described epidemic keratoconjunctivitis in all its phases, summarizing its history and extension over the world, as well as the work that was done isolating its virus and the methods used in controlling the disease.

Discussion. Dr. Robert A. Moore said it was remarkable that in such a short period of time Major Sanders and his colleagues had been able to recognize the disease, isolate its virus, and prove that this virus was related to the disease. He was particularly interested in the effect of the virus on the body as a whole. He asked if there had been any observation made on the presence or absence of the virus in the lymph nodes, or if any occlusion bodies had been demonstrated.

Major Sanders answered that it was quite possible that there was a systemic distribution of this virus, although its locus is obviously in the eye. Especially in the New York group, patients complained of considerable malaise; 24 patients were kept from work not because they had corneal involvement but because of general discomfort, malaise, and headaches. Some patients were unable to sleep; some complained of symptoms of rhinitis. In one case the virus was isolated in secretion from the trachea. No occlusion bodies had been demonstrated.

Dr. M. Hayward Post reported that a Chicago ophthalmologist had had the disease and showed considerable improvement in his vision, as well as clearing of the cornea, apparently after taking 10,000 units of vitamin C intravenously daily.

Major Sanders replied that riboflavin, typhoid vaccine, tuberculin, and sulfonamides had all been given without any benefit. He did not know of the effect of vitamin C on the course of the disease, although in the test tube it had no effect on the virus.

Dr. John Green commented upon the possibility of the epidemic having originated in India or in some other Oriental country. He asked if there had been any epidemics of the disease in England and wondered if there was any evidence that the spread of the disease in this country could have been the work of enemy agents.

Major Sanders replied that the epidemic had probably originated in the Orient and spread to the West Coast from there. He said that there was a mild outbreak of the epidemic in London in 1933, and there was one in Germany in about 1935. There was no evidence that the spread of the disease was the work of enemy agents.

Dr. B. Y. Alvis asked if there was any known solution that would discourage the growth of the virus or increase the resistance of the patient to the disease.

Dr. Saunders answered that the virus is rather notably resistant to mild antiseptic solutions but that convalescent serum if given early enough would increase the patient's resistance to the disease. In reply to further questioning Major Sanders said that the incidence of the disease was not affected by age or by sex. In Schenectady there was a ratio of two to one between males and females which exactly equalled the ratio of the two sexes doing the work. He said that the procedure in determining compensation was going to be difficult and could not be determined definitely until the ultimate result of the disease was known. Serum from patients on the West Coast had been tested on patients in the East. In explaining why there had been only 8 cases in 150,000 workers in the Saint Louis area he said that the prompt isolation of the few cases that had occurred had prevented its spread and that perhaps the virulence of the disease is gradually becoming less.

Dr. Robert Moore asked for further information concerning the presence of neutralizing antibodies. How long were they demonstrable after an attack of the disease? Did the virus invade the body in some cases and not in others?

Dr. B. Y. Alvis asked if immunity to this virus could be produced by inoculating with other viruses. He mentioned the effect of smallpox vaccination on herpes of the cornea.

Major Sanders replied that neutralizing antibodies had been demonstrated nine months after infection. In one case with a small palpable lymph gland the titer was still going up at the end of that time. Neutralizing antibodies are frequently not demonstrated unless there had been marked glandular involvement. Apparently in the mild form of the disease the virus does not penetrate the body as a whole.

Major Sanders, in answer to Dr. Alvis, said that there were certain possibilities in treatment by inoculation and that there was no reason why they could not be tried.

James Bryan,
Editor.

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SCIENTIFIC MEETINGS IN WAR TIME

The eightieth annual meeting of the American Ophthalmological Society, held at The Homestead, Hot Springs, Virginia, on May 29th, 30th, and 31st, was ably conducted by the president, Dr. John Green. The attendance under the circumstances was good, representative of about one half the total membership.

This was, as always, a delightful meeting. Half the daylight hours, during which the sun shone and the temperature was perfect, were spent in recreation, a much-needed rest for the overworked doctors, who cannot take time off in their home town.

The program was good and included several outstanding papers. Of particular interest to the editor was that of Dr. Algernon B. Reese on "Deep-chamber glaucoma due to the formation of a cuticular product in the filtration angle." Beautiful slides were shown illustrating the laying down of a membrane in the filtration angle, presumably by the endothelium, in the cells of which changes similar to those seen in dystrophia epithelialis corneae were observable. Of importance also was the contribution of Dr.

J. S. Friedenwald and Wilhelm Buschke on "Some factors concerned in the mitotic and wound-healing activities of the corneal epithelium." A method for studying the mitotic activity in corneal epithelium was described, as was the effect of various agents on this activity. The importance of movement of the adjoining cells into the denuded area as compared to the relative activity of cell multiplication was stressed.

New officers elected were Dr. S. Judd Beach, president; Dr. Eugene M. Blake, vice-president; and Dr. Frederick C. Cordes, as new member of the Council. Dr. Walter Atkinson was reëlected secretary-treasurer. Dr. Louis S. Green was appointed to take the place of Dr. Sanford R. Gifford, deceased. The Homestead was selected for the next meeting, for which tentative dates of June 4th, 5th, and 6th were set, on the assumption that these would dovetail with those to be chosen for the American Medical Association convention, which is planned for New York, but for which the dates have not as yet been selected.

Shortly after the above meeting had ended, the ophthalmologists were wending their way to Chicago for the meetings of the Association for Research in Ophthalmology and the American Medical Association. The usual transportation and housing difficulties were encountered, but attendance was about 70 percent of the usual. By the fourth day of the American Medical Association meeting more than 7,000 members had registered. For the Research meeting 86 registered. Exceptionally good papers were presented, considering the absence of young workers in the Armed Forces. Since the papers read at the Research meeting will appear in this Journal no comment will be made on them here.

The facilities at the Sherman Hotel for the Section meeting were very good. The loud speaker functioned satisfactorily and the lantern was operated intelligently. Unfortunately, the weather was hot and the air conditioning absent in the lecture room. This tended to inhibit concentration of attention, but the two first-mentioned factors were of more importance than even the last, and made up for deficiencies of ventilation.

The American Medical Association meeting was opened with the Chairman's Address by Dr. Conrad Berens, who outlined ideals for the preparation for a career as an ophthalmologist. His viewpoint was broad and sound. He touched on some of the controversial points in ophthalmic associations, among other things, recommending a broader point of view in regard to optometry. Dr. William L. Benedict, the guest of honor, gave an interesting illustrated talk on the "Diagnosis of orbital tumors." Encouragement in the treatment of bilateral retinoblastoma with irradiation was given by Drs. Hayes Martin and Algernon B. Reese, who had been remarkably successful with this treatment in the second eye. A further use for eikonic lenses—namely, in high astigmatism and oblique axes—was excellently outlined by Dr. Hermann M. Burian and Kenneth N. Ogle.

A new mydriatic and cycloplegic (dibutoline) was described by Dr. Kenneth C. Swan. It seems to have certain advantages over those routinely used and possibly may be of value in the treatment of anterior-segment inflammations. Its disadvantages were also pointed out. Methods of ophthalmo-rhinologic surgery for dacryocystitis were outlined—by Dr. Harold Gifford, Jr., from the ocular standpoint and by Dr. Laverne B. Spake from the nasal. Probably each method in the hands of an expert is satisfactory. Unfortunately, there is not sufficient material for all who attempt ophthalmic surgery to become efficient, and

these complicated procedures are chiefly successful in the hands of those who are continually performing major surgical operations.

There was much talk of medical economics and ophthalmo-optometric relationships outside of the meetings, but in executive session the only action taken was to authorize the appointment of a committee of five to consider these matters. It was understood that plans might be presented soon to the membership for their consideration at the next meeting of the Section.

Dr. Frederick C. Cordes was elected chairman, and Dr. Grady E. Clay, vice-chairman for the coming year.

Although protests are frequently voiced against the holding of scientific meetings during this period of essential heavy travel and overcrowding of hotels which are understaffed and which suffer from food and drink shortages, the majority of physicians support the idea that these scientific meetings are of sufficient value to justify them. Certainly, they are more important than are a host of other meetings that keep the hotels in the large cities constantly crowded. It is obvious that unessential travel has never been seriously curtailed. It is equally certain that the Government is not vitally concerned in the matter, otherwise it would not wink at the holding of conventions, which could easily be discouraged by a simple prohibition, if they were thought to be really derogative to the war effort. They do serve a good scientific purpose and afford the doctor opportunity of getting a little release from the enormous strain under which he is working.

Lawrence T. Post.

PAIN

Pain is essentially a warning of injury or of impending injury, or of threatened destruction of tissue. To ignore pain is to display either stoicism or such a condition of mental exaltation that pain is temporarily thrust into the subconscious.

Vivid experience of pain occurs in all the higher animals. It is probably shared by the lower animal orders, although lack of voice, or of voice such as reaches human ears, renders us less directly aware of such pain. Questions have been raised as to the existence of something analogous to pain in the vegetable world. Plants certainly display protective reactions to injurious influences, but the problem whether they have what we call feeling is somewhat metaphysical.

Most human beings are relatively lacking in sympathy with regard to pain in the animal world below man, although the reality of such sympathy is vouched for by many passages in ancient and modern literature, as well as in laws and organizations whose purpose is to prevent or punish cruelty to animals.

Sympathy with pain in others depends fundamentally upon our own experience in suffering, and our visualization of what might happen to ourselves under similar circumstances. Capacity for such sympathy must therefore be bounded on the one hand by the degree of our own sensibility, and on the other hand by the extent of our own experience, or at least by the scope of our imagination in regard to what we have learned of the experience of others.

It is impossible for each one of us to know with certainty just what are the sensations of others under given circumstances. Those sensations may be much more severe, or conceivably much less severe, than we should have to face, or ever have faced, under apparently similar conditions.

It is likely that the greater intensity of pain expressed by a few individuals in the presence of what most of us regard as

mild disturbances is not purely imaginary but real, its exaggerations depending upon a pathologic sensibility. A patient usually tolerant to his daily experiences, even to such circumstances as may be capable of causing mental distress, may shriek and writhe during the use of a hypodermic needle, whereas other individuals, far from robust, show themselves quite phlegmatic to so trivial an injury.

At such a moment the more sensitive individual may actually sustain a torture beyond his power of philosophic endurance. In other persons there is no philosophy of endurance, but a riotous and unreasoning fear and imagination of physical torment. As to the sensation of pain, just as in many other phases of life, certain persons never grow out of their childhood. On the other hand, some adults who have never ceased being children in other respects will display remarkable fortitude with regard to pain.

It must be remembered that two individuals, apparently intelligent, healthy, and vigorous, may vary greatly as to innate sensibility. Even in the presence of equally excellent visual acuity, one person may show a surprising sharpness of response to tests for minute fractions of astigmatism, while another person may prove tantalizingly incapable of discriminating as to astigmatic fractions quite readily apprehended by the ordinary run of patients.

In like fashion, it is probably true that some patients are definitely made more comfortable by correction of astigmatism down to eighth-of-a-diopter differences, especially where the balance between the two eyes is concerned, although other patients may be utterly insensitive to uncorrected errors of a half diopter or more. It is even conceivable that very rare individuals are capable of experiencing eyestrain from astigmatic differences of less than an eighth diopter. Who shall venture to set arbitrary limits to sensibility? Variations in sensibility are well illustrated in the field of aniseikonia, where small size differences are apparently much more important to some patients than are much larger size differences to others.

To the physician the significance of pain is most widely found in the field of diagnosis. Much has been written on this subject from a more or less philosophic point of view. The course of lectures first published three quarters of a century ago by Mr. John Hilton, Clinician at Guy's Hospital, London, under the title of "Rest and pain" is rightly regarded as a medical classic. Another book combining wide experience with the shrewd observations and intuition of a medical master mind is that recently issued from the pen of Walter C. Alvarez, of the University of Minnesota and the Mayo Clinic, entitled "Nervousness, Indigestion, and pain."

Hilton's famous work was designed especially to give his surgical students and other readers an understanding of the relationship between anatomic details and symptomatology. Alvarez' volume is described by the author in his preface as "a different sort of book—one which deals more with sick unhappy persons than with their diseases . . . more with the handling of patients than with the giving of medicines . . ."

In the daily practice of ophthalmology, the greatest amount of time is commonly devoted to the measurement of refractive errors. The patient may complain merely of poor vision, but in many cases the history includes complaint of pain or discomfort.

The ophthalmologist does well to obtain and record personally the history of the patient, for only in this way can he establish that personal relation between physician and patient which is the basis

of good medical practice. By cross-examination he may learn important details as to the patient's daily activities, including the time of day at which the pain or discomfort usually develops. He will at times suspect that headache is not ocular in origin. Headache in the early hours of the morning, for example, may occasionally depend upon use of the eyes during the evening hours, but it is sometimes due to vasomotor reactions in the nose and accessory sinuses, and these reactions may be connected with draughts or changes of temperature in the sleeping quarters toward morning.

One should carefully investigate symptoms of an apparently migrainous character, bearing in mind that headache may have a migrainous basis without manifesting all the typical elements of the migraine syndrome. Instead of presenting the preliminary scotoma scintillans, followed by headache, dizziness, nausea, and vomiting, a migrainous patient may experience only a scotoma, or may have the scotoma followed by headache, or headache without scotoma or nausea, or headache and nausea without other symptoms.

Migraine commonly represents an inherited nervous tendency for which there is no complete and final cure. Yet in some patients it may either be cured, or at least greatly lessened in frequency and severity, by removal of an important exciting cause. Some very definite cases of migraine are actually cured by an accurate refractive correction, while in others the refractive correction gives the patient some, although incomplete, relief from the attacks.

When dealing with a history of migraine, the ophthalmologist may often render valuable service as a psychoanalyst. The migrainous patient is usually a person with keen sense of responsibility, whose busy days are crowded with many tasks, each of which is a "trouble met halfway." The patient needs to learn that to undertake these successive tasks and responsibilities with the greatest possible efficiency and the least possible waste of nervous energy he should devote himself to the thing in hand without worried consciousness of what has already been done or of the mountain of jobs that remain to be accomplished. It is also useful to suggest a general attitude of muscular relaxation of those parts of the body not concerned in the activity of the moment.

The patient may need to be advised of the destructive effect of that form of mental perturbation which arises from irritation against the task, against other persons, or against the patient himself on account of dissatisfaction as to the degree of his own efficiency in action or in personal relationships. In other words he must cultivate concentration without tension. The lesson will of course be more effective if the physician himself displays the attitude which he seeks to inculcate in his patient.

Even the ophthalmologist, puzzled by neuro-ocular symptomatology for which he has found apparently inadequate explanation, may profit at times by realizing the expediency of inquiring delicately into the existence of secret problems which more than physical causes plague the life of his patient.

While in many of our nervous patients the necessity for working without tension, and without emotional frictions, is of great significance, we ought never to overlook the fundamental importance of rest. Many ocular irritations are decidedly increased by lack of sufficient sleep. The senile or presinile patient who believes himself capable of working just as hard and just as continuously as he did many years ago will last longer and accomplish more if he learns to go more slowly and to rest from his labors more frequently than was perhaps necessary in his earlier days.

Balanced judgment as to the meaning

of the pain symptom is of particular importance in dealing with malingering. In a case of injury where insurance or industrial compensation is involved, a complaint of pain exaggerated beyond the evidence of actual damage to the organ of vision is always suggestive of intent to deceive. The workman who shows no inflammation or destruction in the anterior segment of the eye, yet persistently complains of pain and distress on exposure to light, and insists on squeezing the eyelids together during examination, is wholly or partly malingering.

As opposed to the general fact that pain is a warning, we are faced by a group of conditions in which pain is entirely absent, at least in the earlier stages of the disease. This is true of some malignant tumors, whether superficial or deep. The pain produced by deep-set conditions is commonly reflex in character, the deeper tissues being relatively poor in direct sensibility. Pain gives us no direct warning at all with regard to changes in the optic nerve, retina, or choroid. The most tragic example of this absence of warning is simple glaucoma, in which the patient may go along for years without pain and perhaps regarding his gradual loss of sight as something proper to his declining years and in which no treatment is indicated or would avail.

In some surgical cases our estimate of the importance of pain or its absence will depend partly upon our previous experience of the individual, partly upon other ocular symptoms. To the patient who has an exaggerated sensibility we must often make light of his pain. But some patients must be coaxed to acknowledge pain, and we must occasionally be on our guard against trusting the phlegmatic patient who confesses no pain, for the lack of this symptom may serve to mislead us.

W. H. Crisp.

BOOK NOTICE

YOUR EYES. By Sidney Fox, Sc.M. (Ophth.), M.D. Clothbound, 191 pages exclusive of index; illustrated. New York, Alfred A. Knopf, 1944. Price $2.75.

This book is the best of recent publications about the eye for laymen. It has the double virtue of being informative and interesting. The material is well arranged and handled with a light touch. Starting with some physiology, the author progresses through Causes for poor vision, Presbyopia, and History of eye glasses. The subject of Color vision is treated in an entertaining manner. This leads naturally to comments on Color lenses. The Eye muscles come in for a brief chapter, the Eye in traffic occupying somewhat more space.

An attempt is made to take the headache out of the ophthalmologist-optometrist relationship. To one who has had to explain the differences between oculist, optician, and optometrist daily for 30 years there seems little hope that the public, no matter how well approached, will ever make the discrimination.

Quackery is discussed in a short chapter. A consideration of the eye of youth and of old age finishes a book that may suitably be recommended for lay consumption. There is not much material that will be new to the ophthalmologist, although he will have an enjoyable hour in glancing through it.

Lawrence T. Post.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

5

CONJUNCTIVA

Arruga, H. **Conjunctivitis sicca.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 68-71.

The condition occurs mostly in females between 25 and 60 years of age. The symptoms are dryness, feeling of sand in the eyes, photophobia, and impaired vision. The conjunctiva is thickened, red, and dry, and there is a ropy discharge. The cornea is frequently involved, showing a filamentous keratitis. Often there is associated dryness of the pharynx and larynx and swelling of the parotid glands. The ocular disturbance is due to lack of tears, the cause for which usually cannot be determined. A few cases are due to extirpation of the lacrimal gland, dacryoadenitis, or fracture of the base of the skull. Ovarian dysfunction is thought to be the cause of some cases. No treatment is effective except permanent closure of the puncta by galvanocautery.

J. Wesley McKinney.

Belmonte Gonzalez, J. **Conjunctival reaction to low temperatures in persons not accustomed to extreme cold.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 77-78.

Thirty to forty percent of the Spanish soldiers serving with the Blue Division (in Russia) suffered from an evanescent conjunctival inflammation which cleared up in a few hours with or without treatment when the individual was brought indoors or when the weather became less cold.

J. Wesley McKinney.

Castellanos, L. **Ariboflavinosis as a probable cause of vernal conjunctivitis.** Arch. of Ophth., 1944, v. 31, March, pp. 214-216.

The author believes the cause of vernal conjunctivitis is a deficiency of riboflavin, the deficiency being due to more rapid destruction of the vitamins by the ultraviolet rays of sunlight or to the demand for a greater quantity of this vitamin during the hot season. Kreibich and Dimmer have expressed the opinion that vernal conjunctivitis

is caused by solar rays, and have compared it to pellagra and other vitamin-deficiency dermatoses.

The author claims that 92 percent of 105 patients treated were improved. The treatment consisted of administering during the hot season of the year one to three tablets of riboflavin, 1 mg. each (containing 400 Sherman units). Also prescribed were a few drops of a solution of 0.05 gm. of tetracaine hydrochloride and 15 drops of epinephrine hydrochloride (1 to 1,000) in 5 c.c. of distilled water, the solution to be used only when the symptoms became accentuated. The patient was advised to drink as much milk as possible, because of its riboflavin content. Under the treatment described, 35.7 percent of those treated are said to have shown improvement in all ocular symptoms on the third or fourth days; and 65.1 percent to have improved in from ten to fifteen days. The other nine patients did not return for examination. (References.) R. W. Danielson.

Derrick, E. H. **Swimming-bath conjunctivitis, with a report of three probable cases and a note on its epidemiology.** Med. Jour. Australia, 1943, v. 2, Oct. 23, pp. 334-336.

Outbreaks of conjunctivitis among bathers have been described in Europe and America. Many of the cases are examples of a specific disease a characteristic feature of which is the presence of inclusion bodies in the epithelial cells of the inflamed conjunctiva. These are colonies of the causative virus and consequently the disease is often called "inclusion conjunctivitis" or "inclusion blennorrhea." It is caused by a filter-passing virus, and ends in resolution. After an incubation period of three to four days, it starts unilaterally, the other eye is affected two to three weeks later, and the acme is reached in three to four days. The bulbar conjuntiva is relatively unchanged. In seven to ten days follicles appear, the inflammatory symptoms die out in from three to four weeks, in four to six months the condition resembles folliculosis, and the follicles slowly disappear. Thygeson and Stone state that the oral use of sulfanilamide cures this form of conjunctivitis rapidly.

Three cases are reported, in boys aged 12, 8, and 8 years respectively. The history is almost the same in all cases. The boys had spent several hours in a swimming bath on November 14, 1942. The first boy was affected on November 21st. The conjunctiva of the left eye became rapidly red, with swollen lids, while the cornea was not affected. The next day general symptoms started, with high temperature which lasted for five days, subsiding then by rapid lysis. A month later there was a marked bilateral folliculosis. In the second boy the left eye was affected severely first, and then slightly the right. The third case had both eyes affected. Symptomatology and diagnosis, and also chlorination of water, are discussed. (References.)

M. Lombardo.

Pelayo, M. **Diagnosis of afollicular trachoma.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 79-84.

The three cardinal symptoms of trachoma are granulations, pannus, and conjunctival cicatrices. The diagnosis is more or less certain if any one of these symptoms is present. There are a few cases wherein apparently only a mild conjunctivitis exists. In view of the importance of trachoma as regards contagion the author advises careful examination of the upper fornix. Of

diagnostic importance is the finding of fine scarring and even symblepharon in the upper fornix.

J. Wesley McKinney.

6

CORNEA AND SCLERA

Bloomfield, Sylvan. **The use of tyrothricin, a bacterial extract, in the treatment of marginal ulcers of the cornea.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 500-504. (References.)

Lee, O. S., and Hart, W. M. **The metabolism of the cornea.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 488-500. (6 figures, 7 tables, references.)

Pallinger, B. D., and Mann, I. **Avascular healing in the cornea.** Jour. Path. and Bact., 1943, v. 55, April, p. 151.

Avascular healing of the cornea in lesions caused by chemical burns was studied in rabbits. This occured if the corneoscleral junction was uninjured and free from edema. During healing there was invasion of the substantia propria by wandering cells in far greater number than usually seen. Evidence was found that some of these cells act as macrophages, while others are transformed into keratoblasts and fibrocytes. A transformation of others into corneal corpuscles seemed probable. T. E. Sanders.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Graham, Colin. **Atophanyl in the treatment of sympathetic ophthalmia.** Canadian Med. Assoc. Jour., 1944, v. 50, Feb., p. 156.

The author reports the fortunate outcome of a very severe case of sympathetic ophthalmia in a male aged 19 years treated with injections of atophanyl. Infected teeth and tonsils were removed. Despite a white eye with normal corrected vision, tuberculin injections were continued in the presence of a positive Mantoux reaction.

F. M. Crage.

Páez Allende, F. **Aniridia.** Anales Argentinos de Oft., 1943, v. 4, April-May-June, pp. 65-68.

A six-year-old boy presented numerous congenital defects of the eyes and adnexa. The antecedents were normal. The eyebrows met on the dorsum of the nose, the left palpebral fissure was narrower than the right, microcorneas with embryotoxon were present, there were small pigment spots on the lens capsule, and posterior cortical opacities were seen. The irises were apparently totally lacking and the zonular fibers were visible. The vision was 1/10 in each eye. (References.)

Eugene M. Blake.

Wurster, H. C. **Sympathetic ophthalmia.** Jour. Indiana State Med. Assoc., 1944, v. 37, March, pp. 130-135.

Eight weeks after a perforating wound of the left eye and two operations, sympathetic uveitis developed in the right eye. The injured eye was then enucleated, but the right eye ultimately degenerated. A brief summary of the etiology, diagnosis, and treatment, culled from several current books and journals, follows. Charles A. Bahn.

8

GLAUCOMA AND OCULAR TENSION

Harrington, D. O. **A new impression tonometer.** Trans. Pacific Coast Oto-Ophth. Soc., 1942, v. 27, pp. 145-149.

The author defines a tonometer as an instrument for measuring ocular im-

pressibility by depth of indentation produced with a given force over a constant area of the cornea. Noting that about fifty different instruments have been devised for measuring intraocular pressure, he urges correlation and standardization of instruments and scales of pressure, based entirely on terms of actual intraocular pressure as suggested by Friedenwald. The writer's new impression tonometer is said to meet the experimentally proved and accepted fundamental Schiötz specifications. Lawrence G. Dunlap.

Kronfeld, P. C. **Indications for paracentesis of the anterior chamber.** Jour. Indiana State Med. Assoc., 1944, v. 37, March, pp. 113-116.

In glaucomas secondary to uveitis, except when associated with iris bombé, paracentesis is indicated after conservative methods have failed. It should not be done more than twice. In some progressive corneal ulcers, emptying of the anterior chamber causes the cornea to become less convex, favoring healing. By interfering with closure, the anterior chamber may be kept draining for three weeks. The same is true in some cases of nonsuppurative, nonnecrotizing, nonsyphilitic deep keratitis. In chronic uveitis without ciliary injection, paracentesis may favor healing by removing the blood-aqueous barrier. Paracentesis is of little or no value in narrow-angle glaucomas, in wide-angle glaucomas of the chronic simple type, or in glaucomas secondary to obstruction of retinal veins. Paracentesis may be performed with a hypodermic needle, a paracentesis knife, or a keratome. A slightly ragged incision favors longer drainage. Its effect on intraocular tension is: (1) an initial drop, (2) a restoration, (3) the hypertensive phase, (4) the hypotensive phase. In nonglaucomatous eyes the canal of Schlemm is filled with blood after paracentesis until the intraocular tension reaches about 15 mm. of mercury. Surgical removal of hyphema should be done only in cases of severe ocular contusion with rapid hypertension. Charles A. Bahn.

9

CRYSTALLINE LENS

Carreas Duran, B. **Heterophoria and surgical aphakia.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 52-55.

When cataract extraction has been delayed one or more years in the second eye, the presence of diplopia occasionally mars an otherwise happy result. The heterotropia found in this situation was latent in the individual before cataract extraction and becomes manifest as a result of prolonged interference with the fusion faculty by the poor vision of one eye. The author advises that, when heterophoria is demonstrated by the ordinary test during the stage of incipiency, the interval between cataract extraction in the two eyes be as short as possible.

J. Wesley McKinney.

Castro Basto, R. A. de. **Extraction of cataract in its capsule.** Med. Jour. Australia, 1943, v. 2, Oct. 16, pp. 314-315.

The writer discusses extracapsular and intracapsular methods, with analysis of 40 operations, 35 being total extractions of which 31 were performed on women. The visual results were as follows: 6/5 in 2 cases, 6/6 in 17 cases, 6/9 in 3 cases, 6/12 in 6 cases, 6/15 and 6/21 in 2 cases each, 6/24 and less in 8 cases. Vitreous prolapse occurred in 10 cases, iris prolapse in 2, detached cho-

roid in one, intraocular hemorrhage in one. M. Lombardo.

Gill, E. G., and Gressette, J. H. **Recent advances in intracapsular cataract surgery.** Virginia Med. Monthly, 1943, v. 70, Oct., p. 501.

The authors state that the technique described has given them uniformly good results. The article is accompanied by six illustrations of the various steps in the technique. Using silk sutures in the lid and under the superior rectus muscle, the eye speculum need not be used. This allows the surgeon to close the eye quickly without removing the sutures. The conjunctival flap is made and sutures placed before the keratome incision. The keratome incision is enlarged with scissors. Using a central suture for traction the iris is brought clearly into view. Iridectomy can be done carefully and deliberately, and the coloboma can be inspected. By use of the traction suture the lens can be seen the moment it presents itself in the wound, and the Verhoeff capsule forceps can be placed accurately, the lens being grasped at the equator. In the author's experience, astigmatism with this type of incision has been one fourth to one half less than with the Graefe-knife incision.

Theodore M. Shapira.

Neblett, H. C. **Bilateral cataract from electrical shock?** Southern Med. and Surg., 1944, v. 106, May, p. 12. (See Section 16, Injuries.)

Reese, A. B. **Congenital cataract and other anomalies following German measles in the mother.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 483-487. (References.)

Robbins, B. H. **Dinitrophenol cataract: production in an experimental animal.** Jour. Pharmacol. and Exper. Therapeutics, 1944, v. 80, March, pp. 264-267.

Dinitrophenol produces cataracts in man and fowls, but not in rats, rabbits, guinea pigs, and dogs. After four to six hours, faint anterior cortical lens opacities appear in chickens and ducks which have been on a diet containing 0.25 percent 2:4 dinotrophenol sodium. In 24 hours, the opacities extend over the anterior lens, and somewhat later they involve the posterior portion. The nucleus is usually not involved. With lower concentrations, the opacities are delayed or absent. The earliest lens changes are finely granular dots and vacuoles which later involve several lens fibers at different levels. Intramuscular injection of riboflavin previous to the administration of dinitrophenol does not alter the development of lens opacities. Other nitrophenols act similarly to the dinitro compounds. Dinitrophenol opacities in fowls resemble histologically those similarly produced in man. Charles A. Bahn.

10

RETINA AND VITREOUS

Dienst, E. C., and Gartner, S. **Pathologic changes in the eye associated with subacute bacterial endocarditis.** Arch. of Ophth., 1944, v. 31, March, pp. 198-206.

Subacute bacterial endocarditis is a complication of heart disease which is often brought to the attention of the ophthalmologist because of the striking fundus picture. From the irregular vegetations on the edges of the valves, bacteria and emboli break off and enter the blood stream. The eye is particularly vulnerable to their attack.

The retinal lesions are characteristic. The retina often presents a cloudy ap-

pearance, various types of hemorrhage, small white Roth-Litten spots, occasionally large retinal exudates, and sometimes papillitis and embolism of the central retinal artery. Peculiarly, there is little visual impairment in cases of papillitis, which fact the author explains by saying that the process in these cases is mainly edema instead of cellular infiltration.

In addition to the retinal lesions, there are usually many choroidal infiltrations. Furthermore, examination with the slitlamp may show small floating cells in the anterior chamber and fine keratitic precipitates. (5 case reports, 11 figures, references.)

R. W. Danielson.

Palomar, A. **On juvenile recurrent hemorrhages in the vitreous.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 25-44.

Six cases of this disease were presented in detail. Two were associated with active pulmonary tuberculosis. In one a new hemorrhage followed a tuberculin injection. One was thought to be due to focal infection of dental origin. One was a proved case of Buerger's thromboangiitis. In one no definite etiologic factor could be determined. The cases studied led the authors to the conclusions that tuberculous periphlebitis is the cause of recurrent retinal hemorrhages of the juvenile type (Eales's disease); that an occasional case may be due to focal infection although definite causal relationship cannot be shown; and that thromboangiitis obliterans is a rare cause of the condition.

J. Wesley McKinney.

Sellas Garriga, J. **A case of angiomatosis retinae.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 18-24. (See Section 15, Tumors.)

Spaeth, E. B. **Traumatic liporrhagia retinalis (Verhoeff).** Arch. of Ophth., 1944, v. 31, March, pp. 191-197.

In addition to providing a monographic bibliography, the author aims in this article to obtain a more satisfactory explanation of the pathologic changes in the eye and to determine the mechanical basis of the retinal hemorrhages. Purtscher had originally postulated that the pathology was due to the forcing of cerebrospinal fluid under increased pressure through the perineural-perivaginal lymph spaces. The author takes up the arguments against this theory and then presents the case for the theory that the condition is primarily due to fat emboli from traumatized bone marrow.

He feels that Verhoeff's term, "liporrhagia retinalis traumatica," should be adopted. The ophthalmoscopic picture is characterized by somewhat generalized diffusion of fat droplets in the fundus and by a generalized hemorrhagic appearance in the retina or brain or both, due to factors other than the emboli themselves. There is probably a severe disturbance of the venous circulation in the retina, brain, and brain stem. (One color plate, 2 case reports, bibliography.)

R. W. Danielson.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Costi, C. **Retrobulbar neuritis of hypophyseal origin.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 90-97.

A case of pituitary tumor showed pressure signs in both optic nerves. Deep X-ray therapy caused shrinkage of the tumor and restoration of normal fields and vision.

J. Wesley McKinney.

12

VISUAL TRACTS AND CENTERS

Adler, Alexandra. **Disintegration and restoration of optic recognition in visual agnosia.** Arch. Neurol. and Psych., 1944, v. 51, March, pp. 243-259.

In the tragic fire which occurred in the Cocoanut Grove night club of Boston, in 1942, a patient aged 22 years received slight skin burns. She had permanent effects of carbon-monoxide poisoning. Her inability to recognize the import of visual stimuli was apparently due to a bilateral lesion in the occipito-parietal cortex. The author describes in minute detail the patient's basic condition and her clinical progress, and gives a résumé of the pertinent literature. The patient's permanent vision (apparently uncorrected) was about 20/70, and the visual fields were approximately normal. At the end of a six-months observation period only parts of the whole were perceived and their collective relationships were not recognized. This caused inability to read, to copy letters and geometric figures, or to recognize pictures. Writing was practically unimpaired. Preceding optic impressions superimposed themselves on subsequent ones, interfering with proper perception and recognition. Apparently, the different symptoms of optic agnosia do not have separate localizing significance. Constant practice at building up new methods of visual recognition is the essence of treatment. Charles A. Bahn.

Agatston, Howard. **Ocular malingering.** Arch. of Ophth., 1944, v. 31, March, pp. 223-231. (See Section 1, General methods of diagnosis.)

Costi, C. **Retrobulbar neuritis of hypophyseal origin.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 90-97. (See Section 11, Optic nerve and toxic amblyopias.)

D'Eramo, C. **Traumatic, bilateral, hysterical amaurosis.** Anales Argentinos de Oft., 1944, v. 4., Jan.-Feb.-March, pp. 18-22.

A 24-year-old laborer, covered by compensation insurance, received in the frontal region a blow of moderate severity. He complained of poor distant vision, which soon progressed to complete blindness. The fundi were normal and X rays of the skull were negative. After the patient had been assured that a painful injection in the temple would cure his blindness, a hypodermic of novocaine was given, and this was repeated twice, on successive days. On the fifth day of treatment vision was 20/20. This was the second episode of hysterical blindness in the same patient within two years. Abstracts of similar cases are appended, and a consideration of the mental processes of subjects of hysteria is offered. (References.)

Eugene M. Blake.

Latorre Morasso, S. **Chiasmatic syndrome with oculomotor alterations.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 98-103.

A case of pituitary tumor showed erosion of the posterior clinoids, partial paralysis of all the extraocular muscles on the right side, amaurosis of the right eye, partial temporal anopsia in the left eye, and diabetes insipidus. J. Wesley McKinney.

Mata Lopez, P., and Solis, J. **Observations in a case of pituitary adenoma.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 104-110.

A case of presumed basophilic ade-

noma of the pituitary is reported and discussed. J. Wesley McKinney.

Raaf, John. **The perimetric diagnosis of intracranial tumors.** Trans. Pacific Coast Oto-Ophth. Soc., 1942, v. 27, pp. 131-144. (See Section 1, General methods of diagnosis.)

Voisin, Jean. **Bitemporal hemianopsia in cranial fractures.** Jour. de Chirurgie, 1942, v. 58, Sept.-Dec., pp. 404-417.

With the statement of an individual case recently observed, the author associates a general discussion of the subject. Bitemporal hemianopsia in such cases is of great rarity, of debated prognosis, and of uncertain pathogenesis. Bollack's memoir in 1920 assembled 17 cases, and Voisin has only been able to find forty cases in the literature.

Cases of injury in which bitemporal hemianopsia might occur are often fatal and probably have often passed unrecognized, the importance of a study of the visual field being often overlooked. The X-ray examination often lacks precision as to the nature of the fracture and its radiations. Voisin found indication of symmetry of the two visual fields, although sometimes with slight irregularities, in seven or eight out of the forty recorded cases. In 13 cases the field defect avoided the macular area, while in eight cases it involved the point of fixation. In four cases it reached the macular area on one side and spared the other macula. In one case there was a seeing island inside each of the otherwise blind temporal fields. The visual acuity was usually reduced on both sides. After the first few weeks, there was almost always a papillary atrophy, although two cases showed normal discs after two and four months respectively.

The author is disposed to attribute to microscopic rupture of the fibers of the chiasm the immediate hemianopsias; and to a traumatic optochiasmatic arachnoiditis the secondary hemianopsias.

The single new case described occurred in a woman of 29 years, who on August 28, 1940, attempted suicide by throwing herself from the second floor. When she recovered from the primary lethargy and became accessible to an eye examination, she showed bitemporal heteronymous hemianopsia. The visual acuity of each eye with correction was 4/10. There was crossed diploplia when the eyes were turned to the right, the optic discs had recovered from an earlier slight edema, and the Wernicke hemiopic reaction was positive. (5 sets of fields.) W. H. Crisp.

13

EYEBALL AND ORBIT

Fagin, I. D., Pagel, R. W., and Sand, H. H. **Exophthalmic ophthalmoplegia.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 504-514. (4 illustrations.)

Goetzman, A. C., and Friedman, R. **Cavernous-sinus thrombosis with recovery.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 523-524.

Means, J. H. **The nature of Graves's disease with special reference to its ophthalmic component.** Amer. Jour. Med. Sciences, 1944, v. 207, Jan., pp. 1-19.

The author presents an excellent view of the ocular signs and symptoms of Graves's disease, stressing the relation of the disease as a whole. The pathogenesis of the eye signs is discussed in detail. He stresses the importance of the ophthalmic components of the disease in understanding the proper management of the condition. T. E. Sanders.

Moreu, A. **Concerning a case of aneurysm of the internal carotid in the cavernous sinus of traumatic origin.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 111-119.

A detailed case report with short discussion.

Poppen, J. L. **Exophthalmos. Diagnosis and surgical treatment of intractable cases.** Amer. Jour. Surg., 1944, v. 64, April, pp. 64-79.

The most frequent causation of 43 cases of bilateral and 44 of unilateral exophthalmos seen in the Lahey Clinic between 1933 and 1944 was: bilateral: thyroid disease 28, hypertension 5, brain tumor 4; unilateral: sphenoid-wing meningioma 11, cholesteatoma 3, osteoma 3. Decompression of the orbital roof, basically as described by Naffziger, was successfully performed on 26 of 28 patients. The indication is exophthalmos with progressive visual changes in the cornea, fundus, or ocular muscles after thyroid operation. Exophthalmos may not develop proportionately to the thyroid disturbance, and it may recede very slowly after operation. The Hertel exophthalmometer was used and was considered of marked value. Extraocular paresis was frequent, and often did not entirely disappear after operation. In avoiding orbital decompression, thyroid medication, Lugol's solution, and bilateral cervical sympathectomy were of no value. The quantity and quality of brawny orbital infiltration were considered important in the prognosis and advisability of orbital decompression. This information is judged by the resistance of the eyeball against the orbital tissues upon pressure through the lids. The operation performed in the unilateral cases is not described in this contribution, having been presented in another article. Conservative methods are not justified when the safety of the eyeball is questionable.

Charles A. Bahn.

Puga, Ruy. **Restoration of the inferior fornix by freeing the lid.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 85-89.

A method is presented for restoring an inferior fornix capable of holding a prothesis following scar contraction subsequent to enucleation. In order to disturb the scar tissue as little as possible and thus avoid further contraction, an incision is made on the posterior surface of the lid 1 mm. from the border, from one end of the lid to the other. The incision is made through the tarsus and is carried down its external aspect and beyond to the orbital rim. The cut edge of the tarsus is brought down to the orbital rim and anchored in this position by doubly-armed sutures passed through the lid and tied on the skin surface. The posterior surface of the lid is then covered with buccal mucous membrane. Good results are reported in two cases.

J. Wesley McKinney.

Soley, M. H. **Exophthalmos in diseases of the thyroid.** California and Western Med., 1944, v. 60, Feb., p. 64.

Exophthalmos in thyroid disease is discussed. Using the Hertel exophthalmometer, exophthalmos before and after treatment was measured in 332 thyroid patients. The greatest exophthalmos was produced by toxic diffuse goiters; toxic nodulars were next, and the nontoxic nodulars produced no exophthalmos.

After treatment, 40 percent of those with toxic diffuse or toxic nodular goiters showed progression of exophthalmos following subtotal thyroidec-

tomy, while only 13 percent of those treated by X ray showed progression. Only a very few had any regression following therapy of any type. It is suggested that 5 to 7 grams of thyroid tissue be left in situ when thyroidectomy is performed on a patient with tendency to exophthalmos, instead of the usual 3 to 4 grams.

Robert N. Shaffer.

Thornhill, E. H., and Anderson, B. **Extradural diploic epidermoids producing unilateral exophthalmos.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 477-483. (3 illustrations, references.)

14

EYELIDS AND LACRIMAL APPARATUS

Ellis, O. H. **A combined ptosis operation.** Trans. Pacific Coast Oto-Ophth. Soc., 1942, v. 27, pp. 159-166.

The author presents a combined procedure for correction of ptosis, based chiefly on the Motais operation, which utilizes a strip of the superior rectus tendon when that muscle has normal action. He recalls Jameson's statement that as much as one half of the superior rectus muscle may be used without endangering its function. The technique is detailed. This operation, like the Dickey operation, is simpler than the original Motais.

Lawrence G. Dunlap.

Mata López, P. **Two cases of mycotic blepharitis due to Trichophyton.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 62-67.

Two cases of long standing blepharitis were shown by culture to be due to Trichophyton cerebris. Saboureaud's medium was used for the culture. It was thought that the infection had been acquired from a domestic animal. Tincture of iodine painted on the lid margins is specific for the infection. The possibility of trichophyton infection should be kept in mind in those cases of blepharitis which do not respond to the usual treatment.

J. Wesley McKinney.

Zeno, Lelio. **Hypertelorism associated with median nasal fissure.** Anales Argentinos de Oft., 1944, v. 4, Jan.-Feb.-March, pp. 3-5.

After discussing the occurrence and development of bifid nose and the occasional association of hypertelorism with this defect the author describes a case in a young girl. To correct the depression in the nose a piece of vitalium was inserted under the skin. This also corrected the incidental epicanthus and made the wide separation of the eyes less apparent. (2 illustrations, references.) Eugene M. Blake.

15

TUMORS

Davis, W. T., Sheppard, E., and Romejko, W. J. **Leiomyoma of the iris.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 467-469. (2 color plates, references.)

Flick, J. J. **Tumor of the lacrimal gland.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 362-368. (5 figures, references.)

Iles, A. E., and Short, A. R. **Orbital tumors. Brit. Jour. Surg.,** 1943, v. 31, Oct., pp. 147-150.

The 14 orbital tumors reported include four hemangiomata, three cysts, two sarcomas, one carcinoma, one mixed lacrimal tumor, one diffuse lipoma, one tuberculous encysted abscess, and one of unknown pathology. The youngest patient was 18 and the oldest 70 years of age. Very interesting

were the hemangiomata. Their nature was indicated by a nevoid condition of the lids, the tumor presenting itself as a firm, red, roundish encapsulated mass. Removal by the Krönlein method of such a tumor affecting a patient 70 years old is described in detail. Of the cysts one was a dermoid, another a mucocele of the frontal sinus which had eroded the bony wall.

Of the malignant tumors, an encapsulated sarcoma recurred in the parotid region, a lymphosarcoma had shown no recurrence six months later, and a carcinoma of the lacrimal gland which had been treated with radium a few days after its partial removal had shown no recurrence five years later. None of the cases showed intracranial extension, and in twelve cases a Krönlein operation was performed. Ocular paralyses manifested themselves after the operation in several cases. The authors found the Krönlein method of approach quite satisfactory. In their opinion intraorbital tumors which are located in the outer and lower sections of the orbit are well exposed by the Krönlein method, as are also the tumors within the muscle cone. (2 figures.) Melchiore Lombardo.

Reca, A. B. **Tumor of the optic nervehead.** Anales Argentinos de Oft., 1943, v. 4, April-May-June, pp. 57-62.

A 26-year-old man complained of reduced vision and of a yellowish discoloration of objects, which later appeared smaller than normal. The left eye only was affected and the duration was from one to 1½ years. A reddish mass covered the site of, and extended 2 to 3 disc diameters beyond, the optic disc. General and special examinations revealed no cause for the mass. The actual diagnosis and development of the case are not stated. There follows a discussion of tumors of the optic nervehead. Eugene M. Blake.

Reeves, R. J. **X-ray and radium therapy in lesions about the eye.** North Carolina Med. Jour., 1944, v. 5, March, pp. 85-87. (See Section 2, Therapeutics and operations.)

Sellas Garriga, J. **A case of angiomatosis retinae.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 18-24.

A 17-year-old boy first presented himself in 1923, having casually noticed the day before that his left eye was blind. He was found to have a total detachment of the retina which was attributed to trauma. He returned two years later with impairment of vision in the other eye. Down and out was seen a yellowish-red retinal tumor to which ran an enormously dilated inferotemporal vein and artery. Edema surrounded the tumor and the dilated vessels. A diagnosis of Hippel-Lindau disease was made. The family history was irrelevant. Complete phyical examination was negative. Deep X-ray therapy was instituted, and resulted in disappearance of edema and attenuation of the lesion. Vision of 1/6 was maintained for two years without progress of the lesion. In 1927 tumors developed along the superior nasal vessels. This time deep X-ray therapy did not benefit. In 1929 other tumors were noted and the eye gradually became blind. In 1932 scleral staphylomas appeared in both eyes, coincidentally with attacks of hypertension. The man died in 1937 at the age of 31 years, with massive intestinal hemorrhages which, it was supposed, were due to telangiectases in the intestinal mucosa. The author suggests that this case supports the theory that angiomatosis

retinae and Coats's disease fall within Osler's syndrome of hereditary hemorrhagic angiomatosis.

J. Wesley McKinney.

Tice, G. M., and Curran, E. J. **Treatment of retinoblastoma; radiation therapy supplementing surgical treatment.** Radiology, 1944, v. 42, Jan., p. 20.

Retinoblastoma is second in frequency of the malignant neoplasms of the eye. The treatment, as in the case of any malignant tumor, aims to preserve life. The tendency to metastasize is not great. When the condition is bilateral, one is met with the alternative of (1) saving sight in one eye by destroying the tumor or (2) removing the other eye or removing both eyes. In some few cases either treatment is employed to make the last days of life more comfortable.

In unilateral cases a large percentage of cures is obtainable by enucleation with a long optic-nerve excision. Extension into the optic nerve or orbit cannot be foretold at the time of enucleation. Therefore one cannot be certain that metastasis does not exist.

The ophthalmoscope and the X ray, showing a characteristic picture when calcification has taken place, are the means of diagnosis.

Meningitis following intraorbital instrumentation may occur. From Martin and Reese's discussion of complications after X-ray therapy the following can be listed: corneal and conjunctival keratinization, glaucoma, cataract, and atrophy of the globe. Any of these could occur from the authors' method of radium therapy.

After presenting twenty cases with tabulated results, the authors advocate radiation therapy as supplemental to removal of the eye. Regardless of the pathologic report, a logical procedure is to plant radium adjacent to the optic-nerve stump at the time of enucleation. Radiation therapy of the remaining eye has resulted in some visual preservation and a cure of the disease.

Because of the demonstrable sensitivity of retinoblastoma, an early tumor may be treated and cured by large doses of radiation alone.

Francis M. Crage.

16

INJURIES

Casanovas, J. **Radiography of localization with radiopaque substance at the limbus.** Arch. de la Soc. Oft. Hisp-Amer., 1943, v. 2, Jan.-Feb., pp. 120-124.

A silver ring 11 cm. in diameter and 0.5 mm. in thickness is fastened to the limbus by means of a fine two-pronged hook at each end of the horizontal diameter of the ring. Anteroposterior and lateral X rays are taken, localizing the foreign body in relation to the limbal ring. In order to obtain a measured localization, two circles are drawn one within the other, the smaller 11 mm. in diameter representing the ring on the limbus and the larger 24 mm. in diameter representing the circumference of the eyeball. The position of the foreign body is seen in the frontal X-ray plate as indicated on a diagram, where a circle 11 mm. in diameter represents the ring on the limbus and a circle 24 mm. in diameter represents the circumference of the eyeball. For the lateral view an 11-mm. vertical line is drawn, the ends of which coincide with the circumference of a 24-mm. circle. Taken together these two diagrams give an accurate localization of the foreign body. J. Wesley McKinney.

Chavira, R. A. **Treatment of injuries of the anterior segment of the globe.** Anales de la Soc. Mexicana de Oft., etc., 1942, v. 17, Nov.-Dec., pp. 181-203.

The article describes in detail the treatment of penetrating wounds of the anterior part of the eye as practiced by the author. It is not adapted for abstracting and must be read in the original. Eugene M. Blake.

Cross, A. G., and Ball, J. **Subconjunctival hemorrhage caused by aerobatic flying.** Lancet, 1943, v. 245, Dec. 18, p. 766.

The authors describe the case of an aircraft pilot whose plane executed an inverted spin; that is, the airplane fell, nose down, with the tail describing a circle, and the pilot on the outside of the circle. His vision was blurred, eyes felt "as if they were ready to pop." On landing, he had diplopia, pain on ocular movements, pain back of the left eye, and subconjunctival hemorrhage. After one week, vision was normal and diplopia had disappeared. The subconjunctival hemorrhage disappeared by the fifteenth day.

The symptoms were explained on the basis of orbital hemorrhage, due to the forcing of blood to the head by the centrifugal action of the falling plane. The opposite condition, "blacking out," may occur in a zoom when the blood is sucked away from the head.

Benjamin Milder.

Dansey-Browning, G. C. **The value of ophthalmic treatment in the field.** Brit. Jour. Ophth., 1944, v. 28, Feb., pp. 87-98.

Five hundred and fourteen ophthalmic battle casualties, treated in a mobile ophthalmic unit during the Libyan campaign, are analyzed. An average of 36 hours elapsed between the time of the initial wound and the preliminary examination. After application of a dressing at the regimental aid post, the only treatment received during this time was the oral administration of sulfonamides.

Although operative interference was confined to the absolute minimum, some 200 "major" operations had to be performed. There were 67 cases of intraocular foreign body. Because of prolapse of the iris, 21 of these were operated in the field. The sclera was sutured in 9 cases and simple conjunctival flaps were made for 7 other wounds. Five cases developed panophthalmitis and 13 showed a cyclitis at the end of the first month. Seventeen globes were enucleated.

Among the 22 cases of intraorbital foreign body with perforation of the globe were five cases with traumatic cataract. Two cases were subsequently reported to have retinal detachment and in one the vitreous was filled with hemorrhage. One case developed retinitis proliferans. Two eyes were enucleated. In 31 cases of nonpenetrating intraorbital foreign body the main damage was caused by concussion. There were four cases of optic atrophy. Five had lid injuries, and there were two cases of orbital cellulitis which resolved under oral sulfonamide therapy. There were 12 cases of hemorrhage into the vitreous.

Out of 192 cases of conjunctival, scleral and corneal foreign body, only one developed a hypopyon ulcer. One case with a scleral foreign body developed a pyocyaneus abscess which resolved quickly and without ill effects.

There were 87 disorganized globes. No cases of sympathetic ophthalmitis have been reported from this series. Compared with Würdemann's figures of casualties in 1916, where out of 2,000

ophthalmic casualties only 698 eyes were retained, the total of 114 eyes lost in this series of 514 indicates that the modern policy of treatment in the field has not had adverse end-results. (2 figures, references.)

Edna M. Reynolds.

Gillette, D. F. **A new aid in removal of foreign bodies of the cornea.** Arch. of Ophth., 1944, v. 31, Feb., pp. 129-133; also Trans. Amer. Ophth. Soc., 1943, v. 41.

The author advocates the application of a silver-nitrate solution to foreign bodies of the cornea as an aid in their removal. After anesthetizing the eye with tetracaine, the foreign body is touched with a 1- or 3-percent solution of silver nitrate on a small cotton applicator. This produces a faint, gray swelling of the superficial epithelium, which elevates the foreign body slightly above the level of the surrounding cornea. It is then often possible to remove the foreign body with the end of a sharp toothpick. If the foreign body has been in the eye for some time a dull cystotome is recommended instead of a toothpick. The use of silver nitrate is not recommended in cases in which Bowman's membrane has been injured.

Experimental work on the rabbit cornea demonstrates that the intact epithelium undergoes little change after the use of silver nitrate. Application of silver nitrate to the abraded cornea produces superficial epithelial necrosis. Graphic representation of the location of foreign bodies on the cornea indicates that most of them occur in an area corresponding to the interpalpebral space when the patient is looking down. The earlier a corneal foreign body is removed the simpler is the removal and the shorter the period of disability. (5 figures, 4 tables, bibliography.)

John C. Long.

Hurtault, J., and García Querol, A. **Displacement of intraocular foreign body.** Arch. de Oft. de Buenos Aires, 1942, v. 17, July, p. 417.

A magnetic foreign body lodged in the retina near the macula. In view of the technical difficulties involved, the authors displaced the foreign body to the equator of the eye with the magnet, whence it was extracted without complication. The possibility of changing the surgically unfavorable location of an intraocular foreign body in many cases is pointed out.

Plinio Montalván.

Kazdan, L. **The use of a contact lens to improve vision in a seriously injured eye.** The Canadian Med. Assoc. Jour., 1944, v. 40, Feb., p. 157. (See Section 3, Physiologic optics, refraction, and color vision.)

Leoz Ortin, G. **Ocular hemosiderosis,** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 45-51.

This is a discussion of blood staining of the cornea and other ocular tissues, associated with hemophthalmos resulting from contusion of the eyeball. The typical appearance of the cornea, the course of the condition, the differential diagnosis from dislocated lens, and the pathology are reviewd. If the cornea is observed with the slitlamp in the initial phases of infiltration, a contusive separation of the endothelium may be seen, together with folds and almost always radial tears in Descemet's membrane. It is probable that endothelial separation and tears in Descemet's membrane account for the blood staining seen in hyphemia resulting from contusions. The visual outcome in all

cases has been poor even though the cornea finally became entirely clear. This is attributed to the effects of blood staining of other ocular tissues as well as to the effects of the trauma itself. J. Wesley McKinney.

Matthews, J. L. **Ophthalmic injuries of war.** War Medicine, 1943, v. 4, Sept., p. 247.

The author cites the fact that ophthalmic injuries composed 5 to 8 percent of the wounds in the first World War as evidence of the importance of a general appreciation of the problems connected with such injuries.

Traumatic injuries: Bomb blasts have caused intraocular and retrobulbar hemorrhage, choroidal rupture, and even destruction of an eye. The management of corneal and conjunctival foreign bodies in war casualties does not differ from that in industrial practice, but the intraocular foreign bodies present greater problems since many are nonmagnetic (aluminum-magnesium, plastic glass). Orbital fractures and lacerations of the orbital contents are caused by shell and bomb fragments and by flying débris. Among other conditions seen, the author mentions spastic entropion due to irritation of the infraorbital nerve, and enophthalmos due to orbital fractures. Military experience suggests the policy of anesthetizing an injured eye, flushing with boric acid, and applying a fairly firm dressing before evacuation of a casualty for specialized ophthalmic care. Other suggestions include the use of human hair in corneal lacerations, and careful removal of all bits of uveal tissue from the orbit in the case of a completely disorganized eye.

Thermal burns: Burns have caused a greater percentage of casualties in this war than in the last. In ocular burns, the lids are the most frequently and most severely affected. First-aid treatment, in most cases, must be directed against shock, and the burned areas covered with vaseline gauze, or other nondisfiguring dressings. Conjunctival and corneal burns are treated with irrigation, flaps over burned areas of cornea, free use of lubricants, and prevention of symblepharon. Such burns have been treated with hydrosulphosol, a strong reducing agent with antiseptic and epithelial stimulating properties. Important in treatment of the lids is removal of all oils or greases and careful washing. Many treatments are suggested for facial burns. Among them are gentian violet, with or without silver nitrate; sulfathiazole ointment (20 percent) in petrolatum-oxycholesterol.

Chemical burns are classified on the basis of the physiologic action of the offending agent: (1) Lung irritants (phosgene, chlorine) produce varying degrees of conjunctival irritation. (2) Vesicants (mustard gas, lewisite) produce irritation of lids and conjunctiva in milder cases, marked chemosis and superficial punctate keratitis. Characteristically there is delay of two to six hours from time of exposure to the onset of the symptoms; there is intense blepharospasm. In severe cases, there is corneal vascularization during healing, and there may be recurrences after many years. (3) Lacrimators (tear gas) produce transient ocular irritation, as do (4) irritant smokes (Adamsite). (5) Screening smokes cause no ocular damage, but contact with white phosphorus or (6) incendiary agents will cause circumscribed burns. Treatment is discussed. Benjamin Milder.

Minsky, Henry. **Transcleral removal of intraocular foreign bodies with the**

aid of the Berman locator. Arch. of Ophth., 1944, v. 31, March, pp. 207-210.

When the anterior approach for the removal of an intraocular steel splinter proved unsuccessful after three attempts, it occurred to the author that the posterior route might be rendered less hazardous by use of the instrument which was so effective at Pearl Harbor in the hands of Moorehead. The idea of utilizing magnetism to locate steel in the body has been proposed many times. The development of Berman's locator has made its use more practical.

The locator contains a diagnostic rod having the equivalent of two transformers—one in the handle and the other at the tip. In series the primary coils are connected to the alternating current, and the secondary coils through an amplifying unit to a voltmeter. An alternating current sent through the primary coils induces a secondary current. When the coil in the tip of the rod approaches magnetic metal a difference in potential takes place in the secondary circuit. The amount of the current, shown by deflection of the needle in the voltmeter, varies with the size and distance of the metallic particle. At the greatest point of deflection the tip of the locator is immediately over the foreign body.

The handling of an illustrative case is described in detail. The operative technique consists of a scleral flap in the region of greatest deflection by the locator, which has been marked with a silk intrascleral suture. A barrage of seven microcautery punctures is made around the flap with the Kronfeld needle. The needle is also used to cauterize lightly the exposed sclera and underlying retina in order to prevent subsequent retinal detachment. The foreign body is then allowed to cut its way through the choroid and retina under the pull of the magnet. The author agrees with Spaeth in deprecating the introduction of magnet points or magnetized instruments into the vitreous.

If roentgenographic localization is impossible or not immediately available, much time is saved by using the locator at once. In cases in which the differential diagnosis between a foreign body inside the eye and one just outside the sclera is difficult, the problem may easily be resolved by the locator once Tenon's capsule is opened. (9 diagrams, references, discussion.)

R. W. Danielson.

Neblett, H. C. **Bilateral cataract from electrical shock?** Southern Med. and Surg., 1944, v. 106, Jan., p. 12.

This paper reports the case of a thirty-year-old male whose forehead came into contact with a wire carrying 11,000 volts. The author, seeing the patient three months after the accident because of decreasing vision in the right eye, noted fine dust-like opacities on the anterior surface of each lens. There were no other pathologic findings. Corrected vision was: right eye 20/30; left eye 20/20. Within ten months, both lenses were opaque, presenting a "hammered silver" appearance, with a stellate gray opacity lying on the anterior capsule of each lens. In each eye a combined intracapsular lens extraction was performed, with the stellate opacity remaining in the anterior chamber of the right eye. Final corrected vision was 20/20 and Jaeger 1 in each eye.

The author believes that, although no definite etiology can be assigned to a cataract of suspected traumatic origin without having information regarding

the status of the eyes immediately prior to the accident, nevertheless the early appearance of the lens opacities and the history make it quite likely that the case reported represents electrical-shock cataract. Opposed to this diagnosis are the facts that electrical cataracts are usually not progressive, and that they are frequently accompanied by foveal degeneration and optic atrophy. Benjamin Milder.

Schorstein, Joseph. **Gunshot wounds of the fronto-orbital region.** Lancet, 1944, v. 246, Jan. 8, p. 44.

This paper reports ten cases of gunshot wounds involving orbit and frontal lobe of the brain, eight of which were operated upon by the author. Three of the patients were treated by removal of the destroyed brain tissue and bone fragments, followed by primary closure of the dural tears with fascia lata grafts, sewed in place. Two of the three recovered, the one death being due to pulmonary collapse. Four cases were treated by sprinkling the brain cavity with sulfanilamide powder and packing with soft paraffin-gauze packs. There were no fatalities. One case was treated with dural closure and extradural packs. There is no detailed description of the handling of the orbital tissues, or the involved eye, beyond the débridement of the area.

Benjamin Milder.

Smith, H. E. **Actinic macular retinal pigment degeneration.** U. S. Naval Med. Bull., 1944, v. 42, March, p. 675.

On a South Pacific tropical island, 150 patients, with identical complaints and a characteristic ophthalmological picture, were examined. Each patient noted, after 4 to 8 months in the tropics, some blurring of vision, near and distance; and, in some instances, asthenopic symptoms. These patients showed corrected vision of from 20/20 minus to 20/30 (although they had been listed as 20/20 on their health records), and the acuity was lessened by using a pinhole disc. The macula in each case showed either (1) most frequently, sharply defined granular pigment distribution, or (2) increased pigmented tissue arranged radially; or (3) least often, a proliferated mottled pigment disturbance. The area involved was one half disc diameter, there was slight macular edema, and the foveal reflex had a dispersed, honeycombed appearance.

In each case, the patient had been doing outdoor work and had not worn colored glasses (most patients wore no glasses). The condition was not noted among "indoor" workers.

Benjamin Milder.

Trexler, C. W. **War-induced eye injuries.** U. S. Naval Med. Bull., 1944, v. 42, Jan., p. 124.

For the benefit of the Navy physician not specially trained in ophthalmology, the author gives a comprehensive outline of the commoner types of eye injury and their emergency treatment. R. Grunfeld.

Wakeley, Cecil, and others. **Discussion on burns of the eyelids and conjunctiva.** Proc. Royal Soc. Med., 1943, v. 37, Nov., p. 29.

The experiences of several surgeons with various types of war burn are reported and discussed. Findings of particular interest are: the abolition of picric-acid treatment, the lack of success of tannic-acid treatment, use of a cellulose-acetate mask which reduced the incidence of burns, saline dressings, some deaths which may have been caused by poorly supervised use of sul-

fonamides, and successful use of penicillin. Prevention of infection, prevention of fluid loss to lessen shock, contact lenses to prevent symblepharon, the use of only mild coagulants, and early skin grafting are strongly emphasized. Francis M. Crage.

17

SYSTEMIC DISEASES AND PARASITES

Bugnone, Enrique. **Vitamin A, hemeralopia, and the biophthalmometer.** Anales Argentinos de Oft., 1944, v. 4, Jan.-Feb.-March, pp. 6-17. (See Section 1, General methods of diagnosis.)

Dienst, E. C., and Gartner, S. **Pathologic changes in the eye associated with subacute bacterial endocarditis.** Arch. of Ophth., 1944, v. 31, March, pp. 198-206. (See Section 10, Retina and vitreous.)

Izzet Bilger. **Significance of vitamins in ophthalmology.** Göz Klinigi, 1943, v. 1, Sept., p. 43.

A survey of the literature.

Kutscher, M. **Changes in optic function and ophthalmoscopic picture in four patients of the eunuchoid skeletal type who were treated with orchic extract.** Arch. Internal Med., 1943, v. 72, Oct., pp. 461-470.

Four patients of the above type were found to have decreased visual acuity, diminished amplitude of accommodation, contraction of the visual fields with some color defect, and changes in the eye grounds ranging from hyperemia and postneuritic signs to complete decoloration of the nerve heads. After treatment with injections of an orchic extract, all of the above findings showed marked improvement as well as a subjective improvement with a feeling of well-being and loss of fatigue. T. E. Sanders.

Pino, R. H., and Hultin, G. L. **Treatment of asthenopia nonpathologic and nonrefractive in origin.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 520-523.

Poyales, Ureña. **Contribution to the study of central scotoma due to avitaminosis, or contribution to the study of carential (vitamin deficiency) central scotoma.** Arch. de la Soc. Oft. Hisp.-Amer., 1942, v. 1, Nov.-Dec., pp. 561-567. (See Section 12, Visual tracts and centers.)

Reese, A. B. **Congenital cataract and other anomalies following German measles in the mother.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 483-487. (References.)

Soria Escudera, M. **Conjunctival euliasis.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 72-76.

The author prefers this term to the commonly used "myiasis." Two cases are reported in which the larvae were deposited by a fly which was noticed to pass close to the eye. Severe pain occurred immediately and the eye rapidly became red. Under cocaine the larvae were removed: they were found to be Oestrus ovis.

J. Wesley McKinney.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Bahn, C. A. **Ophthalmic requirements of the military services.** Arch. of Ophth., 1944, v. 31, Feb., pp. 160-161.

This is a statement of changes made in ophthalmic requirements for the various branches of military services from February 1, 1943, to January 1,

1944. The requirements are not listed in full, only the sections involving change being quoted.

John C. Long.

Burke, F. S. **The blind in Canada.** Canadian Jour. Public Health, 1943, v. 34, Aug., p. 347.

The article treats of the causes of blindness, the number of blind people, and their employability, with the addition of various statistical tables. Blind pension is discussed.

Francis M. Crage.

Glover, L. P., and Brewer, W. R. **An ophthalmologic review of more than twenty thousand men at the Altoona Induction Center.** Amer. Jour. Ophth., 1944, v. 27, April, pp. 346-348. (One table.)

Hayes, S. P. **New methods of testing the school achievement of blind pupils.** Outlook for the Blind, 1943, v. 37, Dec., p. 277.

Due to slowness of Braille reading, the standard achievement tests are not fully adaptable to testing the blind pupil without some modification. Several changes and omissions are necessary to provide for the special needs of the blind. Such is, for instance, the modified oral test. The tester reads the question and the pupils read the alternative answers in Braille, then the questions are read aloud a second time and the pupil marks with a pencil the answer he prefers. The matching test, which requires a rapid glancing to and fro, is replaced by the multiple-choice test. The pupil has before him a set of five dots for each question. The tester reads the questions and the alternative answers several times aloud, and the pupil is then supposed to draw a line through the dot in the row which corresponds to the best answer. For example, if the best answer is the fifth word, the pupil draws a line through the fifth dot. R. Grunfeld.

Irwin, R. B. **Why rehabilitation of the blind is a function of a special agency for the blind.** Outlook for the Blind, 1943, v. 37, Dec., p. 275.

The author sets forth the reasons why it is necessary for the vocational rehabilitation of the blind to be carried out by special agencies, as provided by the Barden-La Follette bill recently enacted into federal law.

The various state agencies, the Department of Welfare, the Department of Education, and so on, have neither the special knowledge, available time, nor the equipment necessary for vocational rehabilitation of the blind, nor can they provide the special social care needed by the blind to give them continuous supervision and to maintain employment opportunities. The formation of a special agency, furthermore, avoids the creation of duplicate agencies for rehabilitation of those who are not eligible for employment, particularly the young, who may constitute 75 percent of the blind population. Since the law provides only for those who have no other means of rehabilitation, the financial resources of the blind must be investigated. The special agency is best equipped to make such investigations. R. Grunfeld.

Kerby, C. E. **Eye conditions among pupils in schools for the blind in the United States, 1941-1942.** Outlook for the Blind, 1943, v. 37, Nov., p. 245.

The article is the ninth published summary of the Committee on Statistics for the Blind in the United States. The schools and their enrollment are

listed. The various tables include a rather extensive one showing the causes of blindness. This report refers to the year 1941-1942, with no new causes added, but a suggestion follows showing need for more detailed information in those cases of blindness from general diseases which are reported simply as "prenatal origin, cause not specified." Francis M. Crage.

Kronfeld, P. C. **Preventable blindness.** Jour. Michigan State Med. Soc., 1944, v. 43, March, pp. 209-214.

Approximately 0.1 percent of the population is blind in one or both eyes, there being approximately 130,000 blind persons in this country. In a survey covering an unmentioned number of persons, the percentages of the major causes of blindness were: uveitis 24 percent, glaucoma 16 percent, trauma 15.4 percent, optic atrophy 15 percent, retinopathies 11 percent, and congenital anomalies and hereditary diseases 10.4 percent. Industrial accidents are responsible for bilateral blindness of 8,000 and monocular blindness of 80,000 persons. The author emphasizes the importance of the early recognition of glaucomas and their continued care. Unfortunately, early glaucomas are often not recognized, being concealed behind cataracts and other more easily diagnosed conditions. Early treatment with sulfonamide therapy following perforating injuries of the eye is advised, although the results obtained are not strikingly better than in the presulfonamide era. The only positive protection against interstitial keratitis is efficient prenatal antiluetic therapy before the fifth month, and only very energetic treatment with arsenicals in early syphilis reduces the danger of neurosyphilis and optic atrophy. Charles A. Bahn.

Lavos, George. **Industrial homework for the physically handicapped.** Outlook for the Blind, 1943, v. 37, Oct., pp. 214-218; and Nov., pp. 253-259.

The NRA made the first nationwide attempt to control or virtually to prohibit industrial homework, although some exemptions were granted in the case of the physically handicapped. The control of such homework varies in different states. Obviously for health reasons, some states prohibit the home manufacture of food articles, drinks, food containers, explosives, toys and dolls, and drugs and poisons. In other instances, because of conflict with the nonhandicapped, labor standards deny the blind industrial homework.

The author feels that because of the social and economic dangers involved in homework, its eventual abolition is desirable. Agencies for the handicapped should take steps to abolish the need for exemptions, by adequate programs for the substandard handicapped. (4 tables, references.)

Francis M. Crage.

Lowenfeld, Berthold. **Dramatic arts for blind children.** Outlook for the Blind, 1943, v. 37, Sept., p. 187.

The use of the dramatic arts in the training of blind children is of extreme value since it brings to the student an opportunity for creative interpretation of a variety of characters and enables him to extend his experiences, while giving him the satisfaction and self-confidence of achievement. Creative activities such as drawing and painting are impossible. Modeling and music, although valuable, have technical aspects which make them not so generally applicable.

Since 1940 a teacher-training course has been given, first under the sponsorship of the president of the Ameri-

can Foundation for the Blind, and later under a grant from the Rockefeller Foundation. This has led to establishment of a Dramatic-Arts Project, which has given assistance to this program in many of the resident schools for the blind throughout the country. Progress in personality adjustment and in training of the blind child by this means has so far been very gratifying.

Owen C. Dickson.

Nicholls, J. V. V. **Ophthalmology in the R.C.A.F.** Canadian Med. Assoc. Jour., 1944, v. 40, April, pp. 335-338. (See Section 1, General methods of diagnosis.)

Paula Santos, B. **Refractive errors in schoolchildren of São Paulo.** Arquivos Brasileiros de Oft., 1943, v. 6, Oct., pp. 151-157.

A statistical report, along familiar lines. The author appears to be associated with the School Health Service of São Paulo. W. H. Crisp.

Rehabilitation of the blind in Army hospitals. Outlook for the Blind, 1943, v. 37, Sept., p. 191.

This is a statement of the rehabilitation program as issued from the office of the Surgeon General of the United States Army. The policy consists briefly of establishing, at the earliest possible moment, contact between the blinded casualty and trained personnel including psychiatrist, psychologist, and social worker. Experience arising from the St. Dunstan's movement in England during the last war demonstrated the value of early association of the newly blind and a blind individual who has made an adjustment to his own handicap. This is important before the psychological aspects of deprivation of sight have made deep inroads on the personality.

This program is not to supplant the work of the Veterans Administration Facility but to initiate such action while the patient may still require convalescent care in one of the Army hospitals. Facilities are at present available at the Valley Forge General Hospital in Phoenixville, Pennsylvania, and at Letterman General Hospital in San Francisco, California. Early transfer of blinded cases to these centers is the present aim. The complete program includes instruction in special techniques, development of a philosophic outlook, vocational advice, psychologic and psychiatric study, and arrangements with other agencies for further care. Owen C. Dickson.

Shoemaker, R. E. **Emergency-room service at Wills Hospital.** Arch. of Ophth., 1944, v. 31, March, pp. 211-213.

The author presents a résumé of the number of patients, the types of cases encountered, and the methods used in handling the large number of patients in the emergency room at Wills Hospital, Philadelphia.

R. W. Danielson.

Smith, V. M. **The problem of prevention of blindness among glaucoma patients.** Med. Woman's Jour., 1943, v. 50, Dec., p. 301.

The National Society for the Prevention of Blindness has organized a special campaign for the control of glaucoma. Its objectives are to educate the general public concerning the early signs and symptoms of glaucoma, to offer informative material to professional groups, and to establish special glaucoma clinics in order to secure an early diagnosis and adequate treat-

ment. Since most of the special clinics earlier established have been abandoned due to reduction of staff, the Society has started a demonstration clinic in one of the leading hospitals of New York City. It is intended to prove the value of keeping glaucoma patients under close supervision in order to study the effectiveness of treatment. It aims also to gather research data by the use of special record forms and to provide professional groups with a center for observation and training; and to train volunteers in the charting of visual fields and other details of diagnosis and general care.

R. Grunfeld.

Stinchfield-Hawk, Sara. **Motokinesthetic speech training applied to visually handicapped children.** Outlook for the Blind, 1944, v. 38, Jan., p. 4.

Up to this time provision for the problems arising in connection with the education of the preschool blind child has not been made. It has been shown by speech surveys that there exists a larger percentage of speech defects among the blind than in an unselected group of seeing children of the same age. Educational prognosis in the blind becomes less favorable with speech defects. Motokinesthetic training, enabling the children to control their speech muscles, is an important step in the education of these doubly handicapped individuals; but too little is being done. F. M. Crage.

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ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Gruenwald, Peter. **Studies on developmental pathology. 1. The morphogenesis of a hereditary type of microphthalmia in chick embryos.** Anat. Record, 1944, v. 88, pp. 151-178.

The author describes the morphogenesis of a hereditary type of microphthalmia in chick embryos which is transmitted by a single autosomal recessive gene. A regular succession of stages was found leading to uniform conditions in all embryos of comparable age. The initial stage is formation of minute cysts in the retina. The cells lining these cavities divide mitotically and thus form abnormal centers of growth. Some retinal folds appear, with similar abnormal folds in the ectodermal layers of the iris and ciliary body. These folds later undergo degeneration. The pecten is absent and the scleral cartilage is relatively normal. The lens is only slightly reduced in size, but the eyeball itself is finally reduced to about one half its size. The chicks hatch but soon die, being blind. The significance of these changes is discussed. T. E. Sanders.

Marinis, F. **Bar-eyed mosaics in drosophilia.** Jour. of Heredity, 1943, v. 34, Aug., p. 227.

This is a short technical article on the genetic changes in the eyes of the fruit fly. Francis M. Crage.

NEWS ITEMS

Edited by Dr. Donald J. Lyle
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month.

Deaths

Dr. Calvin Bates, Cambridge, Ohio, died March 28, 1944, aged 87 years.

Dr. Henry B. Beeson, Racine, Wisconsin, died March 4, 1944, aged 62 years.

Dr. Will O. Bell, Seattle, Washington, died February 3, 1944, aged 67 years.

Dr. M. Robert Byrnes, Indianola, Nebraska, died March 3, 1944, aged 73 years.

Dr. Eliphalet A. Cornell, Sault Sainte Marie, Michigan, died February 19, 1944, aged 81 years.

Dr. John E. Crawford, Bartlesville, Oklahoma, died March 19, 1944, aged 73 years.

Dr. William Thornwall Davis, Washington, D.C., died June 16, 1944, aged 67 years.

Dr. Rudolph T. Ehrhardt, Saint Louis, Missouri, died March 24, 1944, aged 79 years.

Dr. H. A. Gerbig, Independence, Kansas, died February 28, 1944, aged 66 years.

Dr. Paul C. Graham, Columbus, Indiana, died February 25, 1944, aged 64 years.

Dr. Frederick W. Jones, Girard, Kansas, died February 21, 1944, aged 72 years.

Dr. Henry H. McCrea, Matamoras, Pennsylvania, died March 10, 1944, aged 67 years.

Dr. Ambrose V. McRee, Mayfield, Kentucky, died February 28, 1944, aged 82 years.

Dr. Millen A. Nickle, Clearwater, Florida, died March 6, 1944, aged 63 years.

Dr. James E. O'Toole, Scranton, Pennsylvania, died February 21, 1944, aged 60 years.

Dr. Benjamin N. Searcy, Rising Sun, Indiana, died March 6, 1944, aged 66 years.

Dr. Don Rafael Silva, Mexico, D.F., died April 19, 1944.

Dr. William I. Simpson, Los Angeles, California, died February 22, 1944, aged 70 years.

Dr. Adam Weaver, Cumberland, Iowa, died February 26, 1944, aged 77 years.

Miscellaneous

The next examination by the American Orthoptic Council will be held in September-October, 1944. The written examinations will be held at various cities in the country on September 7, 1944. Only those passing the written examinations will be permitted to take the oral and practical tests, to be given in Chicago, October 7, 1944. Applications on official forms must be received before August 1, 1944. Address the American Orthoptic Council, 23 East 79th Street, New York 21, New York.

The Board of Regents of the American College of Surgeons has decided to hold the thirty-second annual clinical congress of the American College of Surgeons in the form of a War Session. October 24-27, 1944, in Chicago, Illinois.

The ninth annual assembly of the International College of Surgeons will be held October 3-5, 1944, in Philadelphia. The program will be devoted to War, Rehabilitation, and Civilian surgery.

Societies

The New York Society for Clinical Ophthalmology elected the following officers for 1944-1945: Dr. Milton Berliner, president; Lieutenant Commander Benjamin Friedman, vice-president; Dr. Leon Ehrlich, recording secretary; Dr. Benjamin Esterman, corresponding secretary; and Dr. Daniel Kravitz, treasurer.

Dr. Isadore Givner was a guest speaker at the annual meeting of the Pennsylvania Academy of Ophthalmology and Otolaryngology held at Wilkes-Barre, Pennsylvania, on May 10th. The subject of his address was "The importance of etiological diagnosis in ocular infections."

The Research Study Club of Los Angeles will hold its fourteenth annual mid-winter postgraduate clinical convention in ophthalmology and otolaryngology from January 22 to February 2, 1945. Following this session there will be a special course in "Applied anatomy and cadaver surgery of the head and neck" from February 2-6, inclusive.

Personals

Major Carl J. Rudolph (MC) requests that oculists who have found uveitis or any other eye involvements that may be attributed to rheumatic fever notify him of such findings, with a short résumé of the case history, at Regional Station Hospital, Buckley Field, Colorado.